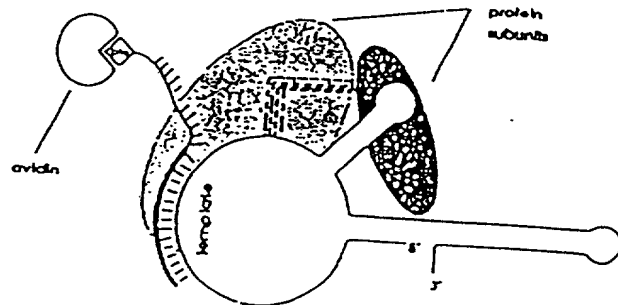


PANEL A



PANEL B

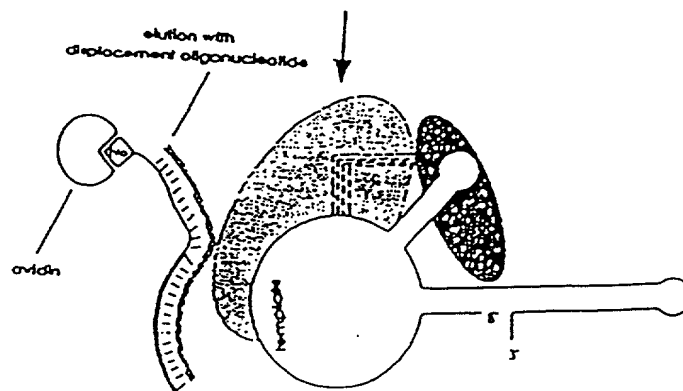


FIGURE 2

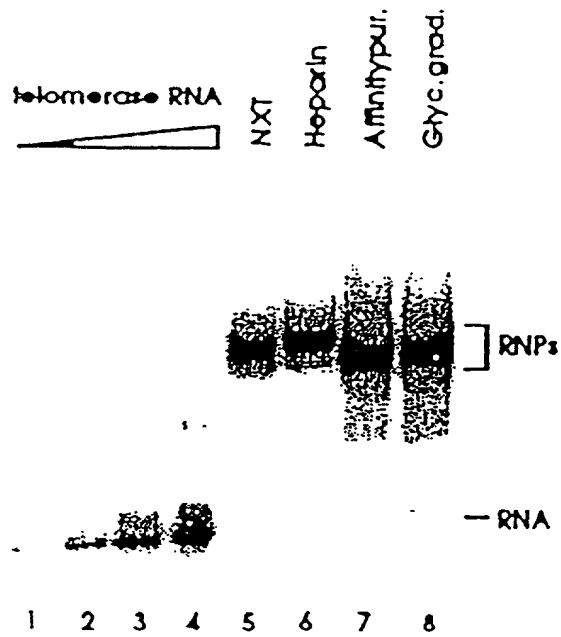


FIGURE 3

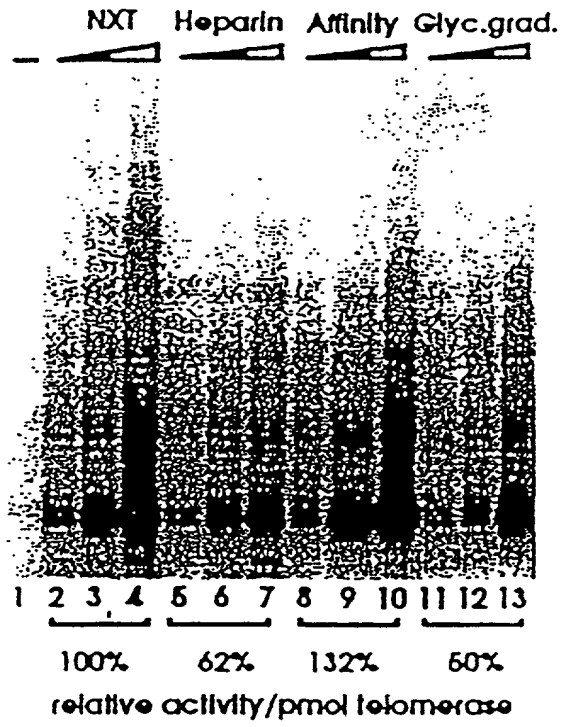


FIGURE 4

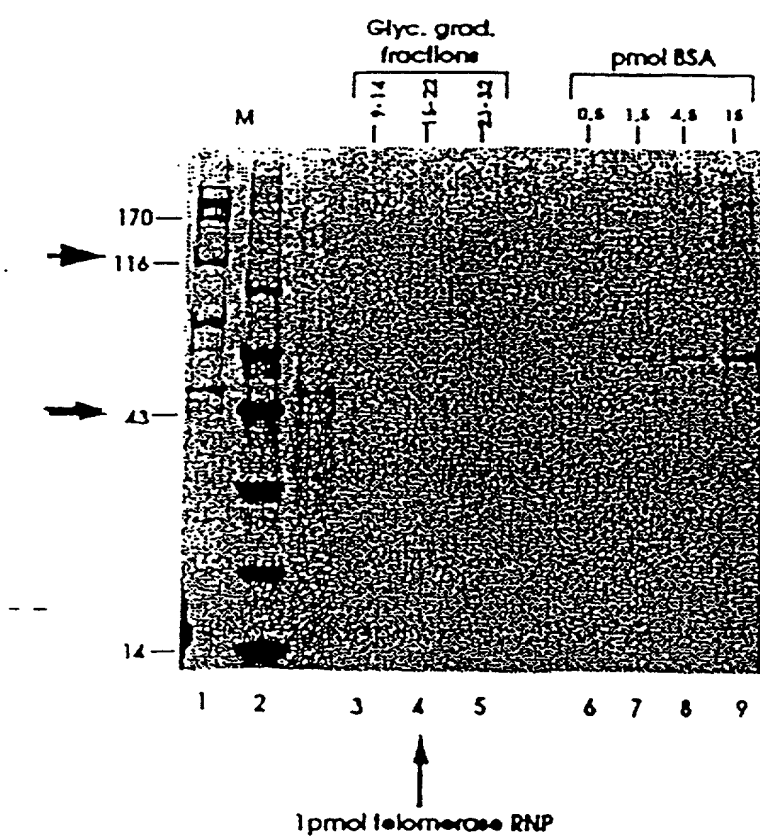


FIGURE 5

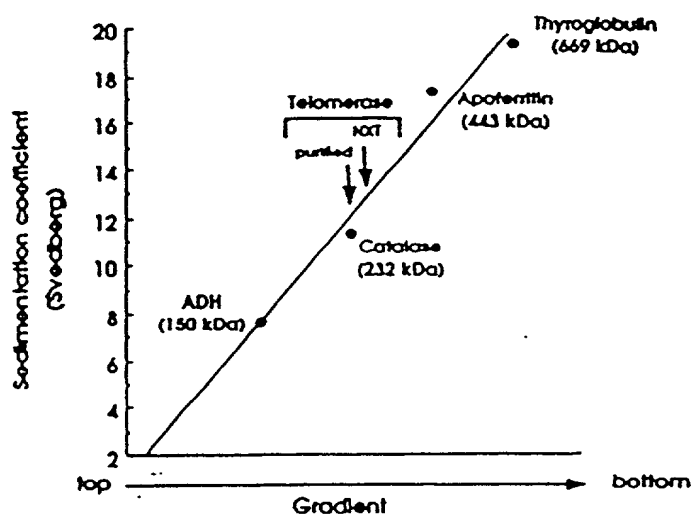


FIGURE 6

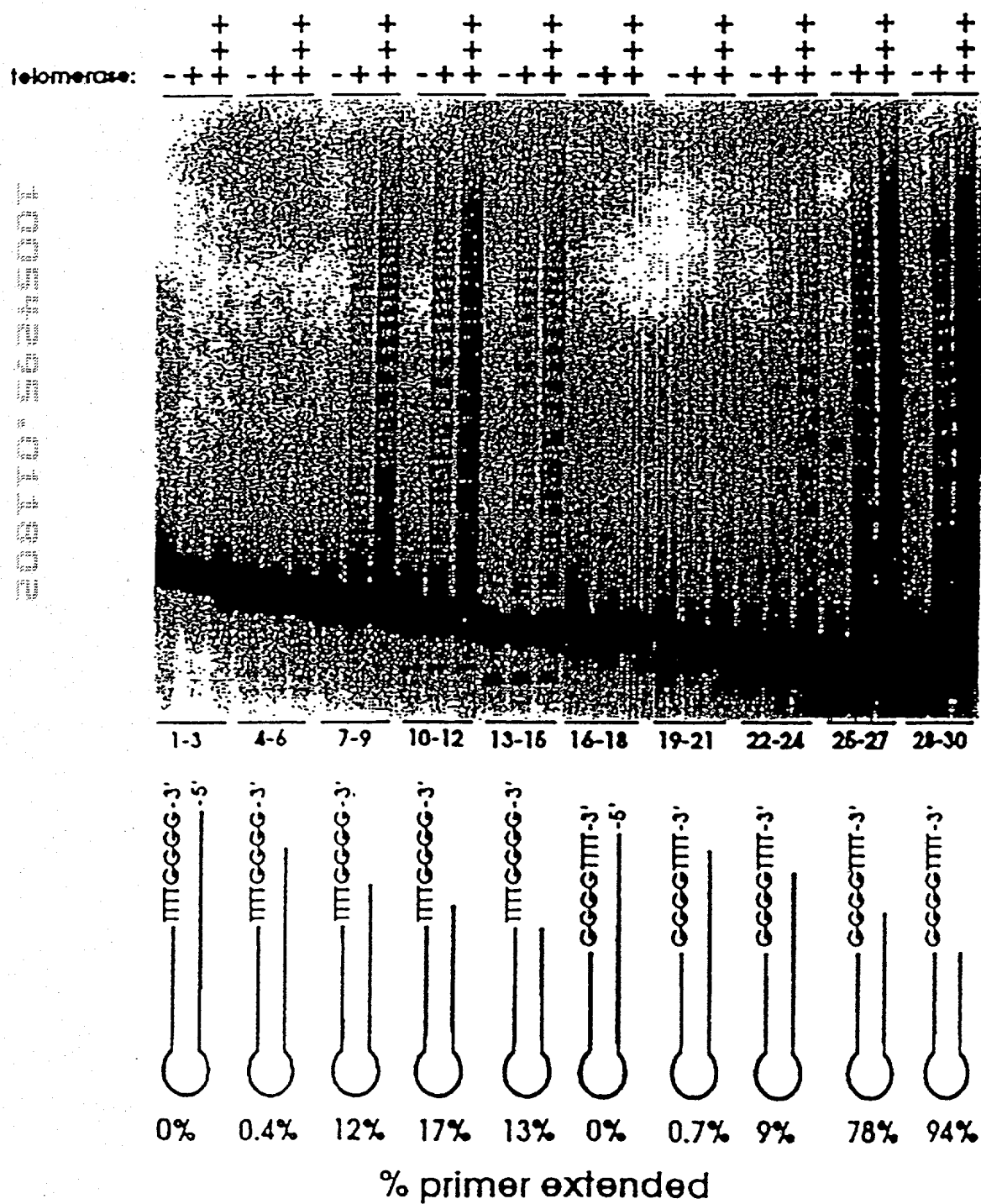


FIGURE 7

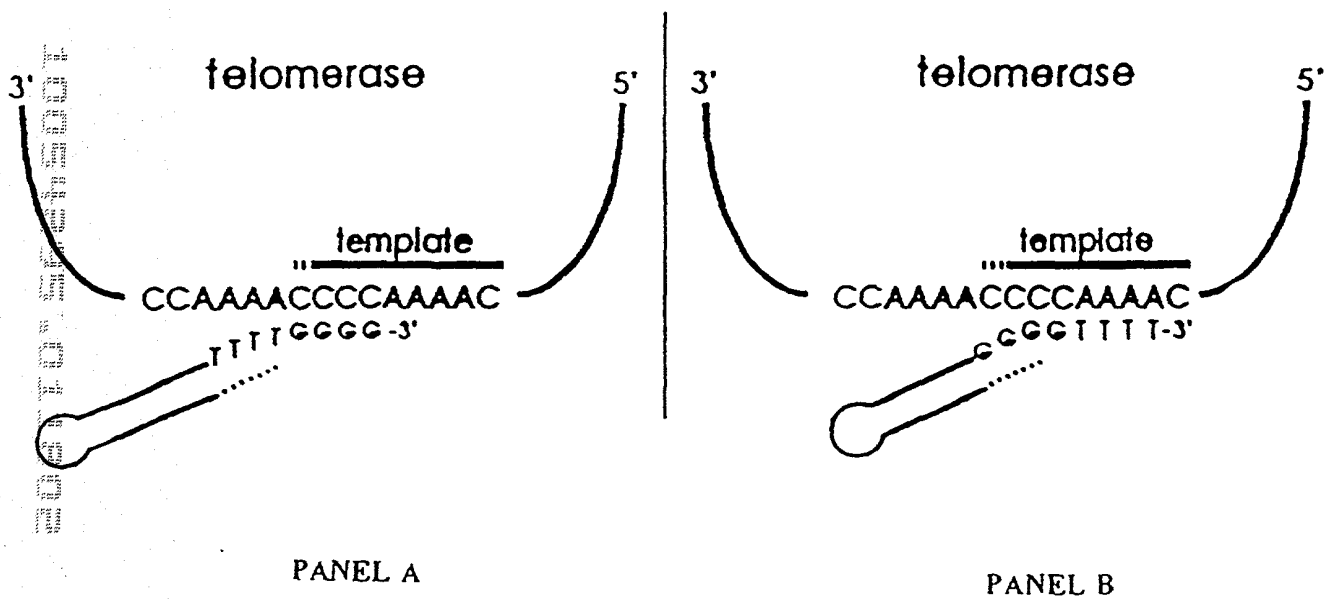


FIGURE 8

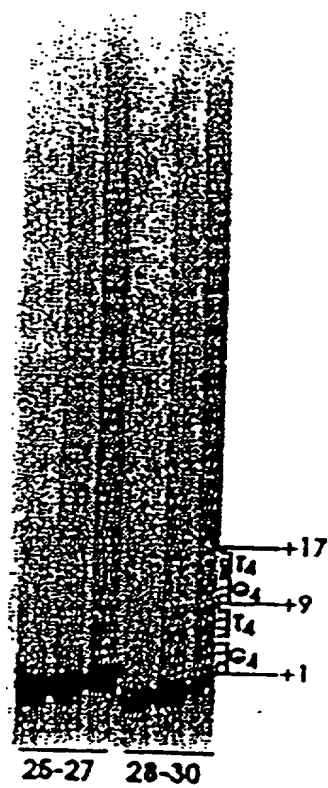


FIGURE 9

1 AAAACCCCAA AACCCCAAAA CCCCTTTTAG AGCCCTGCAG TTGGAAATAT
 51 AACCTCAGTA TTAATAAGCT CAGATTTTAA ATATTAATTA CAAAACCTAA
 101 ATGGAGGTTG ATGTTGATAA TCAAGCTGAT AATCATGGCA TTCACTCAGC
 151 TCTTAAGACT TGTGAAGAAA TTAAAGAAGC TAAAACGTTG TACTCTTGGA
 201 TCCAGAAAGT TATTAGATGA AGAAATCAAT CTCAAAGTCA TTATAAAGAT
 251 TTAGAAGATA TTAAAATATT TCGCGAGACA AATATTGTTG CTACTCCACG
 301 AGACTATAAT GAAGAAGATT TTAAAGTTAT TGCAAGAAAA GAAGTATTTT
 351 CAACTGGACT AATGATCGAA CTTATTGACA AATGCTTAGT TGAACCTCTT
 401 TCATCAAGCG ATGTTTCAGA TAGACAAAAA CTTCAATGAT TTGGATTTC
 451 ACTTAAGGGA AATCAATTAG CAAAGACCCA TTTATTAACA GCTCTTTCAA
 501 CTCAAAGCA GTATTTCTTT CAAGACGAAT GGAACCAAGT TAGAGCAATG
 551 ATTGGAAATG AGCTCTTCCG ACATCTCTAC ACTAAATATT TAATATTCCA
 601 GCGAACTTCT GAAGGAATC TTGTTCAATT TTGCGGGAAT AACGTTTTTG
 651 ATCATTTGAA AGTCAACGAT AAGTTTGACA AAAAGCAAAA AGGTGGAGCA
 701 GCAGACATGA ATGAACCTCG ATGTTGATCA ACCTGCAAAT ACAATGTCAA
 751 GAATGAGAAA GATCACTTTC TCAACAACAT CAACGTGCCG AATTGGAATA
 801 ATATGAAATC AAGAACCAGA ATATTTTATT GCACTCATTT TAATAGAAAT
 851 AACCAATTCT TCAAAAAGCA TGAGTTTGTG AGTAACAAAA ACAATATTC
 901 AGCGATGGAC AGAGCTCAGA CGATATTCAC GAATATATTC AGATTTAATA
 951 GAATTAGAAA GAAGCTAAAA GATAAGGTTA TCGAAAAAAT TGCCTACATG
 1001 CTTGAGAAAAG TCAAAGATTT TAACTTCAAC TACTATTTAA CAAAATCTTG
 1051 TCCTCTTCCA GAAAATTGGC GGGAACGGAA ACAAAAAATC GAAAACCTGA
 1101 TAAATAAAAC TAGAGAAGAA AAGTCGAAGT ACTATGAAGA GCTGTTTAGC
 1151 TACACAACCTG ATAATAAATG CGTCACACAA TTTATTAATG AATTTTCTA
 1201 CAATATACTC CCCAAAGACT TTTTGACTGG AAGAAACCGT AAGAATTTTC
 1251 AAAAGAAAGT TAAGAAATAT GTGGAACATA ACAAGCATGA ACTCATTAC
 1301 AAAAACTTAT TGCTTGAGAA GATCAATACA AGAGAAATAT CATGGATGCA
 1351 GGTTGAGACC TCTGCAAAGC ATTTTATTA TTTTGATCAC GAAAACATCT
 1401 ACGTCTTATG GAAATTGCTC CGATGGATAT TCGAGGATCT CGTCGTCTCG
 1451 CTGATTAGAT GATTTTCTA TGTCACCGAG CAACAGAAAA GTTACTCCAA
 1501 AACCTATTAC TACAGAAAGA ATATTTGGGA CGTCATTATG AAAATGTCAA
 1551 TCGCAGACTT AAAGAAGGAA ACGCTTGCTG AGGTCCAAGA AAAAGAGGTT
 1601 GAAGAATGGA AAAAGTCGCT TGGATTTGCA CCTGGAAAAC TCAGACTAAT
 1651 ACCGAAGAAA ACTACTTTC GTCCAATTAT GACTTTCAAT AAGAAGATTG
 1701 TAAATTCAGA CCGGAAGACT ACAAATTAA CTACAAATAC GAAGTTATTG
 1751 AACTCTCACT TAATGCTTAA GACATTGAAG AATAGAATGT TTAAAGATCC
 1801 TTTTGGATTG GCTGTTTTTA ACTATGATGA TGTAATGAAA AAGTATGAGG
 1851 AGTTTGTGTTG CAAATGGAAG CAAGTTGGAC AACCAAACT CTTCTTTGCA
 1901 ACTATGGATA TCGAAAAGTG ATATGATAGT GTAAACAGAG AAAAACTATC
 1951 AACATTCCTA AAAACTACTA AATTACTTTC TTCAGATTTC TGGATTATGA
 2001 CTGCACAAAT TCTAAAGAGA AAGAATAACA TAGTTATCGA TTCGAAAAAC
 2051 TTTAGAAAGA AAGAAATGAA AGATTATTTT AGACAGAAAT TCCAGAAGAT
 2101 TGCATTGAA GGAGGACAAT ATCCAACCTT ATTCAGTGTT CTGAAAATG
 2151 AACAAAATGA CTAAATGCA AAGAAAACAT TAATTGTTGA AGCAAAGCAA
 2201 AGAAATTATT TTAAGAAAGA TAACTTACTT CAACCAGTCA TTAATATTTG
 2251 CCAATATAAT TACATTAAT TTAATGGGAA GTTTTATAAA CAAACAAAAG
 2301 GAATTCCTCA AGGTCTTTGA GTTTCATCAA TTTTGTATC ATTTTATTAT

FIGURE 9 (cont.)

2351 GCAACATTAG AGGAAAGCTC CTTAGGATTC CTTAGAGATG AATCAATGAA
2401 CCCTGAAAAT CCAAATGTTA ATCTTCTAAT GAGACTTACA GATGACTATC
2451 TTTTGATTAC AACTCAAGAG AATAATGCAG TATTGTTTAT TGAGAAACTT
2501 ATAAACGTAA GTCGTGAAAA TGGATTTAAA TTCAATATGA AGAAACTACA
2551 GACTAGTTTT CCATTAAGTC CAAGCAAATT TGCAAAATAC GGAATGGATA
2601 GTGTTGAGGA GCAAAATATT GTTCAAGATT ACTGCGATTG GATTGGCATC
2651 TCAATTGATA TGAAAACCTCT TGCTTTAATG CCAAATATTA ACTTGAGAAT
2701 AGAAGGAATT CTGTGTACAC TCAATCTAAA CATGCAAACA AAGAAAGCAT
2751 CAATGTGGCT CAAGAAGAAA CTAAAGTCGT TTTTAATGAA TAACATTACC
2801 CATTATTTTA GAAAGACGAT TACAACCGAA GACTTTGCGA ATAAAACTCT
2851 CAACAAGTTA TTTATATCAG GCGGTTACAA ATACATGCAA TGAGCCAAAG
2901 AATACAAGGA CCACTTTAAG AAGAACTTAG CTATGAGCAG TATGATCGAC
2951 TTAGAGGTAT CTAAAATTAT ATACTCTGTA ACCAGAGCAT TCTTTAAATA
3001 CCTTGTGTGC AATATTAAGG ATACAATTTT TGGAGAGGAG CATTATCCAG
3051 ACTTTTTCCT TAGCACACTG AAGCACTTTA TTGAAATATT CAGCACAAAA
3101 AAGTACATTT TCAACAGAGT TTGCATGATC CTCAAGGCAA AAGAAGCAAA
3151 GCTAAAAAGT GACCAATGTC AATCTCTAAT TCAATATGAT GCATAGTCGA
3201 CTATTCTAAC TTATTTTGGA AAGTTAATTT TCAATTTTGG TCTTATATAC
3251 TGGGGTTTTG GGGTTTTGGG GTTTTGGGG

FIGURE 10

1 MEVDVDNQAD NHGIHSALKT CEEIKEAKTL YSWIQKVIRC RNQSQSHYKD
 51 LEDIKIFAQT NIVATPRDYN EEDFKVIARK EVFSTGLMIE LIDKCLVELL
 101 SSSDVSDRQK LQCFGFQLKG NQLAKTHLLT ALSTQKQYFF QDEWNQVRAM
 151 IGNELFRHLY TKYLIFQRTS EGTLVQFCGN NVFDHLKVND KFDKKQKGGA
 201 ADMNEPRCCS TCKYNVKNK DHFLNNINVP NWNMKSRTTR IFYCTHFNRN
 251 NQFFKKHEFV SNKNNISAMD RAQTIFTNIF RFNRIRKKLK DKVIEKIAM
 301 LEKVKDFNFN YYLTKSCPLP ENWRERKQKI ENLINKTREE KSKYYEELFS
 351 YTTDNKCVTQ FINEFFYNIL PKDFLTGRNR KNFQKKVKKY VELNKHელი
 401 KNLLLEKINT REISWMQVET SAKHFYYFDH ENIYVLWKLL RWIFEDLVVS
 451 LIRCFYVTE QQKSYSKTY YRKNIWDVIM KMSIADLKKE TLAEVQEKEV
 501 EEWKKS LGFA PGKLRLIPKK TTFRPIMTFN KKIVNSDRKT TKLTTNTKLL
 551 NSHMLKTLK NRMFKDPFGF AVFNYDDVMK KYEEFVCKWK QVGQPKLFFA
 601 TMDIEKCYDS VNREKLSTFL KTKLLSSDF WIMTAQILKR KNNIVDSKN
 651 FRKKEMKDYF RQKFQKIALE GGQYPTLFSV LENEQNDLNA KKT LIVEAKQ
 701 RNYFKKNLL QPVINICQYN YINFNGKFYK QTKGIPQGLC VSSILSSFYY
 751 ATLEESSLGF LRDESMNPEN PNVNLLMRLT DDYLLITTQE NNAVL FIEKL
 801 INVSRENGFK FNMKKLQTSF PLSPSKFAKY GMDSVEEQNI VQDYCDWIGI
 851 SIDMKTALM PNINLRIEGL CTLNLNMQT KKASMWLKKK LKSFLMNNIT
 901 HYFRKTTITE DFANKTLNKL FISGGYKYM CAKEYKDHFK KNLAMSSMID
 951 LEVSKHYSV TRAFFKYLVC NIKDTIFGEE HYPDFFLSTL KHFIEIFSTK
 1001 KYIFNRVCM LKAKEAKLKS DQCQSLIQYD A

FIGURE 11

1 CCCCAAACC CCAAACCCC AAAACCCCTA TAAAAAAGA AAAAATTGAG
 51 GTAGTTTGA AATAAAATAT TATTCCCGCA CAAATGGAGA TGGATATTGA
 101 TTTGGATGAT ATAGAAAATT TACTTCCTAA TACATTCAAC AAGTATAGCA
 151 GCTCTTGTAG TGACAAGAAA GGATGCAAAA CATTGAAATC TGGCTCGAAA
 201 TCGCCTTCAT TGACTATTCC AAAGTTGCAA AAACAATTAG AGTTCTACTT
 251 CTCGGATGCA AATCTTTATA ACGATTCTTT CTTGAGAAAA TTAGTTTTAA
 301 AAAGCGGAGA GCAAAGAGTA GAAATTGAAA CATTACTAAT GTTTAAATAA
 351 AATCAGGTAA TGAGGATTAT TCTATTTTTT AGATCACTTC TTAAGGAGCA
 401 TTATGGAGAA AATTACTTAA TACTAAAAGG TAAACAGTTT GGATTATTC
 451 CCTAGCCAAC AATGATGAGT ATATTAAATT CATATGAGAA TGAGTCAAAG
 501 GATCTCGATA CATCAGACTT ACCAAAGACA AACTCGCTAT AAAACGCAAG
 551 AAAAAGTTTG ATAATCGAAC AGCAGAAGAA CTTATTGCAT TACTATTTCG
 601 TATGGGTTTT ATTACAATTG TTTTAGGTAT CGACGGTGAA CTCCCGAGTC
 651 TTGAGACAAT TGAAAAAGCT GTTTACAAC GAAGGAATCG CAGTTCTGAA
 701 AGTTCTGATG TGTATGCCAT TATTTTGTGA ATTAATCTCA AATATCTTAT
 751 CTCAATTTAA TGGATAGCTA TAGAAACAAA CCAAATAAAC CATGCAAGTT
 801 TAATGGAATA TACGTTAAAT CCTTTGGGAC AAATGCACAC TGAATTTATA
 851 TTGGATTCTT AAAGCATAGA TACACAGAAT GCTTTAGAGA CTGATTTAGC
 901 TTACAACAGA TTACCTGTTT TGATTACTCT TGCTCATCTC TTATATCTTT
 951 AAAAGAAGCA GCGGAAATGA AAAGAAGACT AAAGAAAGAG ATTTCAAAAT
 1001 TTGTTGATTG TTCTGTAACC GGAATTAACA ACAAGAATAT TAGCAACGAA
 1051 AAAGAAGAAG AGCTATCACA ATCCTGATTG TTAAAGATTT CAAAATTCC
 1101 AGGTAAGAGA GATACATTCA TTAATAATTCA TATATTATAG TTTTTCATT
 1151 CACAGCTGTT ATTTTCTTTT ATCTTAACAA TATTTTTTGA TTAGCTGGAA
 1201 GTAAAAAGTA TCAATAAGA GAAGCGCTAG ACTGAGGTAA CTTAGCTTAT
 1251 TCACATTCAT AGATCGACCT TCATATATCC AATACGATGA TAAGGAAACA
 1301 GCAGTCATCC GTTTTAAAAA TAGTGCTATG AGGACTAAAT TTTTAGAGTC
 1351 AAGAAATGGA GCCGAAATCT TAATCAAAAA GAATTGCGTC GATATTGCAA
 1401 AAGAATCGAA CTCTAAATCT TTCGTTAATA AGTATTACCA ATCTTGATTG
 1451 ATTGAAGAGA TTGACGAGGC AACTGCACAG AAGATCATT AAGAAATAAA
 1501 GTAACCTTTA TTAATTAGAG AATAAACTAA ATTACTAATA TAGAGATCAG
 1551 CGATCTTCAA TTGACGAAAT AAAAGCTGAA CTAAAGTTAG ACAATAAAAA
 1601 ATACAAACCT TGGTCAAAAT ATTGAGGAAG GAAAAGAAGA CCAGTTAGCA
 1651 AAAGAAAAAA TAAGGCAATA AATAAAATGA GTACAGAAGT GAAGAAATAA
 1701 AAGATTTATT TTTTCAATA ATTTATTGAA AAGAGGGGTT TTGGGGTTTT
 1751 GGGGTTTTGG GG

FIGURE 12

1 CCCCCAAACCCCAAAACCCCAAAACCCCTATAAAAAAGAAAAATTGAGGTAGTTTAGA
 60 GGGGTTTGGGGTTTGGGGTTTGGGGATATTTTTCCTTTTAACTCCATCAAATCT
 a P Q N P K T P K P L * K K K K L R * F R -
 b P K T P K P Q N P Y K K R K N C G S L E -
 c P K P Q N P K T P I K K E K I E V V * K -
 AATAAAATATTATTCCTCCGCACAAATGGAGATGGATATTGATTGGATGATATAGAAAATT
 61 TTATTTTATAATAAGGGCGTTTACCTCTACCTATAACTAAACCTACTATATCTTTAA
 120
 a N K I L F P H K W R W I L I W M I * K I -
 b I K Y Y S R T N G D G Y C F G C Y R K F -
 c * N I I P A Q M E M D I D L D D I E N L -
 TACTTCTAATACATTCAACAAGTATAGCAGCTCTGTAGTGACAAGAAAGGATGCAAAA
 121 ATGAAGGATTATGTAAGTTGTTTCATATCGTCGAGAACATCACTGTTCTTCTACGTTT
 180
 a Y F L I H S T S I A A L V V T R K D A K -
 b T S * Y I Q Q V * Q L L * Q E R M Q N -
 c L P N T F N K Y S S S C S D K K G C K T -
 CATTGAAATCTGGCTCGAAATCGCCTTCATTGACTATTCCAAAGTTGCAAAAACAATTAG
 181 GTAACCTTAGACCGAGCTTAGCGGAAGTAAGTATAAGGTTTCAACGTTTTTGTTAATC
 240
 a H C N L A R N R L H C L F Q S C K N N * -
 b I E I W L E I A F I D Y S K V A K T I R -
 c L K S G S K S P S L T I P K L Q K Q L E -
 AGTTCTACTTCTCGGATGCAAAATCTTTATAACGATTCTTCTTGAGAAAATTAGTTTAA
 241 TCAAGATGAAGACCTACGTTTAGAAATATTGCTAAGAAAGAACTCTTTAATCAAAATT
 300
 a S S T S R M Q I F I T I L S C E N * F * -
 b V L L L G C K S L * R F F L E K I S F K -
 c F Y F S D A N L Y N D S F L R K L V L K -
 AAAGCGGAGAGCAAGAGTAGAAATTGAAACATTACTAATGTTTAAATAAAATCAGGTAA
 301 TTTGCGCTCTCGTTTCTCATCTTTAACTTTGTAATGATTACAAATTTATTTTAGTCCATT
 360
 a K A E S K E * K L K H Y * C L N K I R * -
 b K R R A K S R N C N I T N V * I K S G N -
 c S G E Q R V E I E T L L M F K * N Q V M -
 TGAGGATTATTCTATTTTTAGATCACTTCTTAAGGAGCATTATGGAGAAAATTACTTAA
 361 ACTCCTAATAAGATAAAAAATCTAGTGAAGAATTCTCGTAATACCTCTTTTAATGAATT
 420
 a C G L F Y F L D H F L R S I M E K I T * -
 b E D Y S I F * I T S * G A L W R K L L N -
 c R I I L F F R S L L K E H Y G E N Y L I -
 TACTAAAAGGTAACAGTTTGGATTATTTCCCTAGCCAACATGATGAGTATATTAATT
 421 ATGATTTTCCATTTGTCAAACCTAATAAAGGGATCGGTTGTTACTACTCATATAATTAA
 480
 a Y * K V N S L D Y F P S Q Q C C V Y * I -
 b T K R * T V W I I S L A N N D E Y I K F -
 c L K G K Q F G L F P * P T H M S I L N S -

FIGURE 12 (cont.)

481 CATATGAGAATGAGTCAAAGGATCTCGATACATCAGACTTACCAAAGACAAACTCGCTAT 540
GTATACTCTTACTCAGTTTCTAGAGCTATGTAGTCTGAATGGTTTCTGTTTGAGCGATA

a H M R M S Q R I S I H Q T Y Q R Q T R Y -
b I C E C V K G S R Y I R L T K D K L A I -
c Y E N E S K D L D T S D L P K T N S L -

541 AAAACCGCAAGAAAAAGTTTGATAATCGAACAGCAGAAGAACTTATGCAATTTACTATTTCG 600
TTTTGCGTTCTTTTCAAACATTAGCTTGTCTCTTCTGAATAACGTAATGATAAGC

a K T Q E K V C * S N S R R T Y C I Y Y S -
b K R K K K F D N R T A E E L I A F T I R -
c N A R K S L I I E Q Q K N L L H L L F V -

601 TATGGGTTTTATTACAATGTGTTTATAGGTATCGACGGTGAACCTCCCGAGTCTTGAGACAAT 660
ATACCCAAAATAATGTTAACAAAATCCATAGCTGCCACTTGAGGGCTCAGAACTCTGTTA

a Y G F Y Y N C F R Y R R C T P E S C D N -
b M G F I T I V L G I D G E L P S L E T I -
c W V L L Q L F * V S T V N S R V L R Q L -

661 TGAAAAAGCTGTTTACAACCTGAAGGAATCGCAGTTCTGAAAGTTCTGATGTGTATGCCAT 720
ACTTTTTCGACAAATGTTGACTTCCTTAGCGTCAAGACTTTCAAGACTACACATACGGTA

a C K S C L Q L K E S Q F C K F * C V C H -
b E K A V Y N C R N R S S E S S D V Y A I -
c K K L F T T E G I A V L K V L M C M P L -

721 TATTTTGTGAATTAATCTCAAAATATCTTATCTCAATTTAATGGATAGCTATAGAAACAAA 780
ATAAAACACTTAATTAGAGTTTATAGAAATAGAGTTAAATTACCTATCGATATCTTTGTTT

a Y F V N * S Q I S Y L N L M D S Y R N K -
b I L C I N L K Y L I S I * W I A I E T N -
c F C E L I S N I L S Q F N G * L * K Q T -

781 CCAAATAAACCATGCAAGTTTAAATGGAATATACGTTAAATCCTTTGGGACAAATGCACAC 840
GGTTTATTTGGTACGTTCAAATTACCTTATATGCAATTTAGGAAACCTGTTTACGTGTG

a P N K P C K F N G I Y V K S F G T N A H -
b Q I N H A S L M E Y T L N P L G Q M H T -
c K * T Y Q V * W N I R * I L W D K C T L -

841 TGAATTTATATTCGATTCTTAAAGCATAGATACACAGAATGCTTTAGAGACTGATTTAGC 900
ACTTGAATATAACCTAAGAATTTCTGATCTATGTGCTTACGAAATCTCTGACTAAATCG

a C I Y I G F L K H R Y T E C F R D C F S -
b E F I L D S * S I D T Q N A L E T D L A -
c N L Y W I L K A * I H R M L * R L I * L -

901 TTACAACAGATTACCTGTTTGTGATTACTCTTGCTCATCTCTTATATCTTTAAAAGAAGCA 960
AATGTTGCTCTAATGGACAAAACCTAATGAGAACGAGTAGAGAATATAGAAATTTCTTCGT

a L Q Q I T C F D Y S C S S L I S L K E A -
b Y N R L P V E I T L A H L L Y L * K K Q -
c T T D Y L F C L L L I S Y I F K R S R -

961 GGCGAAATGAAAAGAAGACTAAAGAAAGAGATTTCAAAATTTGTTGATTCTTCTGTAACC 1020
CCGCTTACTTTTCTTCTGATTCTTTCTCTAAAGTTTAAACAACCTAAGAAGACATTGG

a G E M K R R L K K E I S K F V D S S V T -
b A K C K E D * R K R F Q N L L I L L * P -
c R N E K K T K E R D F K I C C F F C N R -

1021 CGAATTAACAACAAGAAATATTAGCAACGAAAAAGAAGAGCTATCACAATCCTGATTC 1080
CCTTAATTGTTGTTCTTATAATCGTTGCTTTTCTTCTCTCGATAGTGTAGGACTAAG

a G I N H X N : S N E K E E E L S Q S C F -
b E L T T R I L A T K K K K S Y H N P D S -
c N * Q Q E Y * Q P K R R R A I T I L I L -

FIGURE 12 (cont.)

1081 TTAAGATTTCAAAAATCCAGGTAAGAGAGATACATTCATTAATAATTCATATATTATAG 1140
AATTTCTAAAGTTTAAAGGTCCATTCTCTCTATGTAAGTAATTTAAGTATATAATATC

a L K I S K I P G K R D T F I K I H I L -
b * R F Q K F Q V R E I H S L K F I Y Y S -
c K D F K N S R * E R Y I H * N S Y I I V -

1141 TTTTTCATTTCACAGCTGTTATTTTCTTTTATCTTAACAATATTTTGTAGTAGCTGGAA 1200
AAAAAGTAAAGTGTGACAATAAAGAAAAATAGAATTGTTATAAAAACTAATCGACCTT

a F F I S Q L L F S F I L T I F F D * L E -
b F S F H S C Y F L L S * Q Y F L I S W K -
c F H F T A V I F F Y L N N I F C L A G S -

1201 GTAAAAAGTATCAATAAGAGAAGCGCTAGACTGAGGTAACCTAGCTTATTCACATTCAT 1260
CATTTTTCATAGTTTATCTCTTCGCGATCTGACTCCATTGAATCGAATAAGTGAAGTA

a V K S I K * E K R * T E V T * L I H I H -
b * K V S N K R S A R L R * L S L F T F I -
c K K Y Q I R E A L D C G N L A Y S H S -

1261 AGATCGACCTTCATATATCCAATACGATGATAAGGAAACAGCAGTCATCCGTTTAAAAA 1320
TCTAGCTGGAAGTATATAGGTTATGCTACTATTCTTTGTCGTCAGTAGGCAAAATTTT

a R S T F I Y P I R C * G N S S H P F * K -
b D R P S Y I Q Y D D K E T A V I R F K N -
c I D L H I S N T M I R K Q Q S S V L K I -

1321 TAGTGCTATGAGGACTAAATTTTATAGAGTCAAGAAATGGAGCCGAAATCTTAATCAAAAA 1380
ATCAGGATACTCCTGATTAAAAATCTCAGTTCTTTACCTCGGCTTTAGAATTAGTTTTT

a * C Y E D * I F R V K K W S R N L N O K -
b S A H R T K F L E S R N G A E I L I K K -
c V L C G L N F * S Q E H E P K S * S K R -

1381 GAATTGCGTCGATATTGCAAAAGAATCGAACTCTAAATCTTTGTTAATAAGTATTACCA 1440
CTTAACGCAGCTATAACGTTTCTTAGCTTGAGATTAGAAAGCAATTATTTCATAATGGT

a E L R R Y C K R I E L * I F R * * V L P -
b N C V D I A K E S N S K S F V N K Y Y Q -
c I A S I L Q K N R T L N L S L I S I T N -

1441 ATCTTGATTGATTGAAGAGATTGACGAGGCAACTGCACAGAAGATCATTAAGAAATAAA 1500
TAGAACTAACTTCTCTAACTGCTCCGTTGACGTCTTCTAGTAATTTCTTTATTT

a I L I D C R D * R G N C T E D H * R N X -
b S C L I E E I D E A T A Q K I I K E I K -
c L D C L E K R L T R Q L H R R S L K K * S -

1501 GTAACCTTTTATTAATTAGAGAATAAACTAAATTACTAATATAGAGATCAGCGATCTTCAA 1560
CATTGAAAATAATTAATCTCTTATTTGATTAAATGATTATATCTCTAGTCGCTAGAAGTT

a V T F I N * R I N * I T N I E I S D L Q -
b * L L L I R E * T K L L I * R S A I F N -
c N F Y * L E N K L N Y * Y R D Q R S S I -

1561 TTGACGAATAAAGCTGAACCTAAAGTTAGACAATAAAAAATACAAACCTTGGTCAAAAT 1620
AATGCTTTATTTTCGACTTGATTTCATCTGTTATTTTATGTTTGAACCAAGTTT

a L T K * K L N * S * T I K N T N L C Q N -
b C R N K S C T K V R Q * K I Q T L V K I -
c D E I K A E L K L D N K K Y K P W S K Y -

1621 ATTGAGGAAGGAAAAGAAGACCAGTTAGCAAAAGAAAAAATAAGGCAATAAATAAATGA 1680
TAACTCCTTCCTTTCTCTCGTCAATCGTTTTCTTTTATTCGTTATTTATTTACT

a I E E G K E D Q L A K E K I R Q * I K C -
b L R K E K K T S * Q K K K * G N K * N E -
c C G R K R R P V S K R X N K A I N K H S -

FIGURE 12 (cont.)

1681 GTACAGAAGTGAAGAAATAAAAGATTATTTTCAATAATTTATGAAAAGAGGGGTT 1740

CATGTCTTCACTTCTTTATTTCTAAATAAAAAAGTTATTAAATAACTTTTCTCCCAA

a V Q K C R N K R F I F F N N L L K R G V -
b Y R S E E I K D L F F S I I Y C K E G F -
c T E V K K * K I Y F F Q * F I E K R G F -

1741 TTGGGGTTTTGGGGTTTTGGGG 1762

AACCCCAAACCCCAAACCC

a L G F W G F G -
b W G F G V L G -
c G V L G F W -

FIGURE 13

2 EVDVNOADNHGIHSALKTCEEIKEAKTLYSWIQVIRCRNQSQSHYKDL 51
 19 ELELEMOENQNDIQVRVK...IDDPKQY...LVNVTAACLLQEGSYQDK 62
 52 EDIKFAOTNIVATPRDYNEEDFKVIARKEVF.STGLMIELIDKCLVELL 100
 63 DERRVITKALL...EVAESDPEFICQLAVYIRNELYIRTTTNYIVAF. 107
 101 SSSDVSORQKLQCFGFQKGNQLAKTHLLTALSTQKQYFFQDEWNOVRAM 150
 108 CVVHKNTQPFIEKYFNKAVLLPNDLLEVCEFAQVLYI 144
 151 IGNEFRHLYTKYLIFORTSEGLVQFCGNNVFDHLKVNDKFDKKQKGA 200
 145 FDATEFKNLY...LDRILSQDIRKELTFRKCLQRCVRSKF 181
 201 ADMNE PRCSTCKYNVKNKDHFLNNINVPNNNMKSRTTRIFYCTHF 247
 182 SEFNEYOLGKYCTES...QRKKTFRYLSVTNKQKWDQTKKK... 220
 248 NRRNQFFKKHEFVSNNKNNISAMDRAQTIFTNIFRNRIRKKLKDVKIEKI 297
 221 RKENLLTKLQAIKESDCKSKRETG...DIMNVDAIKALKPAVMKKI 264
 298 AYMLEKVKDFNFNYLTSCPLPENWRERKQKIENLINKTREEKSKYYEE 347
 265 AKRQNAHK...KHMKA PKIPNSTLESXYLTFRD 294
 348 LFSYTTDNKCVTFINEFFYNILPKDFLTGRNRKNFQKVKKYVELNKHE 397
 295 LIKFCHISEP...KERVYKILGKKYPKTEEEYKAAPGDSASAPFN.PE 338
 398 LIHKWLLLEKINTREISWQVETSAKHFYFDHENIYVLWKLRLWIFEDL 447
 339 LACKRMKIEISKTWENELSAKNTAEVDNLISSNQLPYMAMLRNLSN... 386
 448 VVSLRCFFVYTEOQKSYSKTYYYRKNIWDMKMSIADLKKETLAEVQE 497
 387...ILKAGVSD... 394
 498 KEVEEWKKS LGFAPGKLRLIPKKTFRPIMTFNKKIVNSDRKTTKLTTNT 547
 395...TTHS 398
 548 KLLNSHMLKTLKNRMFKDPFGFAVFNYYDDVMKKYEEFVCKWKQVQPKL 597
 399 IVINK...ICEPKAVENSKM 415
 598 FFATMDIEKCYDSVNREKLSTFLKTTKLLSSDFWIMTAQILKRKNIVID 647
 416 F...PLOFFSAIEAVN.EAVTKGFKAKK...RENNMLKGQIEAVKE...VVE 457
 648 SKNFRKKEMKDYFRQKFKIALEGGQYPTLFSVLENEQNDLNKKT LIVE 697
 458 KTDEEKKDM...ELEQTEEGEFVKVNEGIGKQYINSIELAIK 496
 698 AKQRNYFKKDNLLQPVINICQYNYINFNGKFYKQTKGIPQGLCVSSILSS 747
 497 IAVNNKLDEIKGHTAIFSDVSGSMSTSMGGAKKYGSVRTCLECALVLGL 546
 748 FYYATLEESSLGFLRDESMNPENPNVLLMRLTDDYLLITTQENNAVLFI 797
 547 MVKQRCCKSSFYIFSSPSSQCNKCYLEVDL... 576
 798 EKLINVSRENGFKFMKK.LQTSFPLSPSKFAKYGMDSVEEQNIVQDYCD 846
 577...PGDEL RPSMQKLLQEKGLGGG...TDFPYECIDEWTKNKT HVD 617
 847 WIGISIDMXTLALMPNINLRIGILCTNLNMOTKKASMWLKKKLSFLM 896
 618 NIVILSDMMIAEGYSDINVRGSSIVNSI...KKYKDEVN 653
 897 NNITHYFRKTITTEDFANKTLNKLFISSGGYKYMOCACHEYKD.HFKKNLAM 945
 654 PNKIF...AVDLEGY...KCLNLGDEFNENNYIKIFGM 687
 946 SSMIDLEVSKIIYSVTRAFFKYLVCNIKDTIFGEEHYDPDFLSTLKHFI 995
 688 SDSI...LKFI SAKQGA...NMVE 706
 996 IFSTKKYIFNRVC 1008
 707 VI...KNFALQKIG 717

FIGURE 14

132 LSTQKQYFFQDEWNQVRAMIGNEL.FRHLYTKYLIFORTSE..GTLVQFC 178
 1 MSRRNQ...KKPOAPIGNETNLDVFLQNLLEVYKSQIEHYKTOQQOI 43
 179 GNNVFDHLKVNDKFDKKQKGAADMNEPRCCSTCKYNVQNEKDHFLNNIN 228
 44 KEEDLKLLKFKNQDQDGNNGDDDEE.....NNSNKQQLRRVN 84
 229 VPMWNHKSRTTRIFYCTHFNRRNQFFKKHEFVSNNKNISAMDRAQTIFTN 278
 85QIKQVQLIKK...VGSKEKDLNLNEDENKKN 114
 279 IFRFNRIKKLKDVKIEKIAYMLEKVDFNFNYLTSCPLPENWRERKQ 328
 115 GLSEQQVKEEQLRTITEEQVKYQNLVFNMDYQLDLNESGGHRRHRRETDY 164
 329 KIENLINKTREETSKYEEELFSYTTDNKCVTQFINE.FFYNILPKDFTLG 377
 165 DTEKWFESHQK.....NYVSIYANQKTSYCWMLKDYFNK 200
 378 RNRKNFQKKVKKYVELNKHLEIHKNLLEKINTREISWMQVETSAKHFFY 427
 201 NNYDHLNVSINRLE..TEAEFYAFDDFSQTIKLTNSYQTVNID..... 242
 428 FDHENIYVLWKLLRWI..FEDLVVSLIRCFFVTEQQKSYSKTYYYRKN 475
 243 VNFQNNLCILALLRFLLSLERFNILNIRSSY..TRNQYNFEKIGELLETI 290
 476 WDVIMKMSIADLKKETLAEVQKEVEEWKSLGFAPGKLRLIPKKTFRP 525
 291 FAVVFSHR.....HLQGIHLQVPCFAFYLVNSSSQISVKDSQLQ 330
 526 IMTFNKKIWNDRKTTKLTNTKLLNSHMLKTLKNRMFKDPFGFAVFN 575
 331 VYSFSTDLKLVD..TNKVQDYFKFLQEFPRLTHVSQAIPVSATNAVENL 378
 576 DDVHKYEEFVCKWKQVQPKLF.....FATHDIEKCYDS..VNREK 615
 379 NVLLKKVKH..ANLNLVSIPTQFNDFYFVNQLHLKLEFGLPNILTKQK 426
 616 LSTFL.....KTTKLLSSDFWIMTAQILKRNNI..VIDSKNFRKKEMK 657
 427 LENLLLSIKQSKNLKFLRLNFYTYVAQETSRKQILKQATTIKNLKNNKNO 476
 558 DYFRQKFQKIALEGGQYPTLFSVLEN..EQNDLNAKKTLLIVEAKQRYNFK 705
 477 EETPETKDETPSESTSGMKFFDHLSELTELEDFSVN...LQATQEY 520
 706 KDNELQPVINICQYNYINFNGKFKYQTKGIPQGLCVSSILSSFYATLEE 755
 521 DSLHKLIRSTNLKKFKLSYKYEKSKMDTFIDLKNI.....YETLNN 564
 756 SSLGFLRDESNPENPNVNLMLRLTDDYLLITTQENNAVLFIKELINVS 905
 565 ..LKRCVWISNPHGNISYELTN.....KDSTFYKFKLTNLQE 500
 806 ENGFKFNMKKLQTSFPLSPSKFAKYGMDSVEEQNIVQDYCDWIGISIDMK 855
 501 LQHAKYTFK..QNEFQFNNVKSAKIESSSLESLEDIDSLCKSIASCKNLQ 648
 856 TLALMPNINLRIEGILCTLNLMQT..KKASHWLKK..KLKSFLMNNITH 901
 649 NVNI.....IASLLYPNNIQKNPFNKPNNLFFKQFEQLKNLENVINC 691
 902 YFRKTI..TTEDFANKTLNKLFISSGYKYMCAKEYKDHFKKNLAMSSM 948
 692 ILDOHILNSISEFLEKNKKIKAFILKRYLLQYYLDYTKLFTLQQLPEL 741
 949 IDLEVSIIYSVT.....RAFFKYLVCNIKDT..IFGEEHY 982
 742 NQVYINQOLEELTVSEVHKQVWENHKQKAFYEPLCEFIKESSTLQQLIDF 791
 983 PDFFLS..TLNHFIEIFSTKKY..IFNRVCHILKAKEAKLSDQCOSLIQ 1028
 792 DQNTVSODSISIKNILESISESKYHHYLRNPSQSSSLIKSENEEQELLK 840

FIGURE 15

4 DIDLDDIENLLPNTFNKYSSSCSDKKGCKTLKSGSKSPSLTI PK 47
 617 NVKSAKIESSSLESLEDIDSLCKSIASCKNLQNVNIIASLLYPNNIQKNP 666
 48 LQKLEFYFSDANLYNDSFLRKLVLKSGEORVE....IETLLH 86
 667 FNKPNLLFFKQFEQLKNLENVSINCLDQHILNSISEFLEKNKKIKAFIL 716

FIGURE 16

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1 MEMDIDLDDIENL. . . . LPNTFNKYSSSCSDKKGCKTLKSGSKSPS. . . 42
  | | . . . | | . . . | | . . . | | . . .
491 IELAIKIAVNKNLDEIKGHTAIFSDVSGSMSTMSGGAKKYGSVRTCLEC 540

  43 LTIPKLQKQ. . . . LEFYFSDANLYNDSFLRKLVLKSQEQRVEIETLL 85
  | | . . . | | . . . | | . . . | | . . .
541 ALVLGLMHVKQRCESFYIFSSPSSQC�KCYL.EVDLPGDELPSMQKLL 589
  
```

FIGURE 17

| | Motif A | Motif B |
|-------------------|--|---------------------------|
| Consensus | h--h <h>h</h> h--h--h | h----+-- <h>h</h> h--h--h |
| telomerase p123 | QQFKLFFATMDIEKCYDSVNRKLSFLKTYTKLL-100-RFYKQTKGIF <h>h</h> CLCVSSILSSFYATLEZSSSLGFL | QQLCVSSILSSFYATLEZSSSLGFL |
| Dong (LINE) | KNRNLHCTYIDYKKAFFDSIPHSLVLIQVLEIYKIN-28-RQLAIKGIY <h>h</h> QDSLSPLWFCALNPLSHQLHNDR | QQLCVSSILSSFYATLEZSSSLGFL |
| al S.c.(group II) | FGGSNWFRVLDLKKCFDTISHDLIIKELKRYISD-26-HVPVGPVRCV <h>h</h> CAPTSPALCNAVLLRLDRRLAGLA | QQLCVSSILSSFYATLEZSSSLGFL |
| HIV-RT | LKGGKSVTVLDVGDAYFSVPLDEDFRKYTAFTIP-7-GIRYQYNVLF <h>h</h> GWKGSIPAIFQSSMTKILEPFRKQN | QQLCVSSILSSFYATLEZSSSLGFL |
| L8543.12 | VLPELYFMKFLVKSCTDSIPRMECMRILKDALKN-68-KCYIREOGLE <h>h</h> QESSLSA?IVDLVYDDLLLEFYSEPK | QQLCVSSILSSFYATLEZSSSLGFL |

| | Motif C | Motif D | Motif E |
|-------------------|--|-----------------|------------------|
| Consensus | h--Y <h>h</h> DD <h>h</h> h | <h>h</h> h-h--h | h-h <h>h</h> h-h |
| telomerase p123 | -14-LMRLLTDDYLLITTTQENN-0-AVLFIKLLINVSREN <h>h</h> CFKFNMRLLQT-23-QDYCDWIGIS | <h>h</h> h-h--h | h-h <h>h</h> h-h |
| Dong (LINE) | -16-HLIYMDIILYAKNDKE-0-MKKLIDTTTIFSNDSMQFGLRCKT-25-KCJYKYLGFFQ | <h>h</h> h-h--h | h-h <h>h</h> h-h |
| al S.c.(group II) | -55-YVRYADDILIGVLSKN-2-KIIRDLNNSFLNS <h>h</h> ICLTINEERTLI-4-ETPARFLGNYI | <h>h</h> h-h--h | h-h <h>h</h> h-h |
| HIV-RT | -4-IYQYMDLLVVGSHLEIG-1-HRTKIEELRQHLRLWGLTTPDKKHQK-0-EPFLWNGYEL | <h>h</h> h-h--h | h-h <h>h</h> h-h |
| L8543.12 | -8-ILKLAADDFLIISTDQQQ.....VINIKKLAMCGFQKYNANR-41-IRSKSSKGIFR | <h>h</h> h-h--h | h-h <h>h</h> h-h |

FIGURE 18

| | |
|----------------|--|
| telomerase p43 | LQKQIEEYFSDANLYNDSFLRKLVLKSGEQRVEIETLLM |
| human La | ICHQIEEYFSGDENLPRDKFLKEQI.KLDEGWVPLEIMIK |
| Xenopus LaA | ICEQIEEYFSGDENLPRDKFLKQOI.LLDDGWVPLETMIK |
| Drosophila La | ILROMEYFEGDANLNRDKFLREQIGKNEDGWVPLSVLVT |
| S. c. Lhplp | CLKQMEYFSEFNFPYDRELRTTAEK.NDGWVPISTIAT |

FIGURE 19

1 aactcattta attactaatt taatcaacaa gattgataaa aagcagtaaa taaaacccaa
 61 tagatttaatt ttgaaagta tcaattgaaa aatggaaatt gaaaacaact aagcacaata
 121 gccaaaagcc gaaaaattgt ggtgggaact tgaattagag atgcaagaaa accaaaatga
 181 tatataagtt aggggttaaga ttgacgatcc taagcaatat ctctgtaacg tcaactgcagc
 241 atgtttgttg taggaaggta gttactacta agataaagat gaaagaagat atatcatcac
 301 taaagcactt cttaggttgg ctgagtcga tctgagttc atctgctagt tggcagtcta
 361 catccgtaat gaactttaca tcagaactac cactaactac attgtagcat ttgtgttgt
 421 ccacaagaat actcaacctt tcatcgaaaa gtacttcaac aaagcagtac ttitgcctaa
 481 tgacttactg gaagtctgtg aatttgata ggttctctat attttgatg caactgaatt
 541 caaaaatttg tatcttgata ggatacttc ataagatatt cgtaaggaaac tcaacttccg
 601 taagtgttta caaagatgag tcagaagcaa gttttctgaa ttcaacgaat actaacttgg
 661 taagtattgc actgaatcct aacgtaagaa aacaatgttc cgttacctct cagttaccaa
 721 caagtaaaag tgggattaaa ctaagaagaa gagaaaagag aatctcttaa ccaaacttta
 781 ggcaataaag gaatctgaag ataagtccaa gagagaaact ggagacataa tgaacgttga
 841 agatgcaatc aaggctttta aaccagcagt tatgaagaaa atagccaaga gatagaatgc
 901 catgaagaaa cacatgaagg cacctaaaat tctaactct accttggaaat caaagtactt
 961 gaccttcaag gatctcatta agttctgcca tatttctgag cctaaagaaa gagtctataa
 1021 gatecttggg aaaaaatacc ctaagaccga agaggaatac aaagcagcct ttggtgattc
 1081 tgcacttgca ccttcaatc ctgaattggc tggaaagcgt atgaagattg aaatctctaa
 1141 aacatgggaa aatgaactca gtgcaaaagg caacactgct gaggtttggg ataatttaatt
 1201 ttcaagcaat taactcccat atatggccat gttacgtaac ttgtctaca tctaaaagc
 1261 cgtgtttca gatactacac actctattgt gatcaacaag atttgtgagc ccaaggccgt
 1321 tgagaactcc aagatgtcc ctctcaatt cttagtgcc attgaagctg ttaatgaagc
 1381 agttactaag ggattcaagg ccaagaagag agaaaatag aatcttaaag gtcaaatcga
 1441 agcagtaag gaagtgttg aaaaaaccga tgaagagaag aaagatatgg agttggagta
 1501 aaccgaagaa ggagaatttg taaagtcaa cgaaggaatt ggcaagcaat acattaaact
 1561 cattgaactt gcaatcaaga tagcagttta caagaattta gatgaaatca-aaggacacac
 1621 tgcaatcttc tctgatgttt ctggttctat gaggacctca atgtcaggtg gagccaagaa
 1681 gtatggttcc gttcgtactt gtctcgagtg tgcattagtc ctggtttga tggtaaaata
 1741 acgtttgaa aagttctcat tctacatctt cagttcacct agtttcaat gcaataagtg
 1801 ttacttaaga gttagatccc ctggagacga actccgtcct tctatgtaaa aacttttgca
 1861 agagaaagga aaacttgggt gtggtactga ttcccctat gaggcattg atgaatggac
 1921 aaagaataaa actcacgtag acaatatcgt tattttgtct gatatgatga ttgcagaagg
 1981 atattcagat atcaatgtta gaggcagttc cattgttaac agcatcaaaa agtacaagga
 2041 tgaagtaaat cctaacttta aaatctttgc agttgactta gaaggttacg gaaagtgcct
 2101 taatctaggt gatgagttca atgaaaacaa ctacatcaag atattcggtta tgagcgattc
 2161 aatcttaag ttactttcag ccaagcaagg aggagcaaat atggtcgaag ttatcaaaaa
 2221 ctttgcctt caaaaaatag gacaaaagt agtttctga gattcttcta taacaaaaat
 2281 ctacccccac tttttgtt tattgcatag ccattatgaa atttaaatat ttatctattt
 2341 atttaagtta ctacatagt ttatgtatcg cagtctatta gcctattcaa atgattctgc
 2401 aaagaacaaa aaagattaaa a

FIGURE 20

MEIENNQAQQPKAEKLWWELELEMQENQNDIQVRVKIDDPKQYL
VNVTAACLLQEGSYQDKDERRYIITKALLEVAESDPEFICQLAVYIRNELYIRTTTN
YIVAFCVVHKNTQPFIEKYFNKAVLLPNDLLEVCEFAQVLYIFDATEFKNLYLDRILS
QDIRKELTFRKCLQRCVRSKFSEFNEYQLGKYCTESQRKKTMTFRYLSVTNKQKWDQTK
KKRKENLLTKLQAIKESEDKSKRETGDIMNVEDAIKALKPAVMKKIAKRQNAMKKHMK
APKIPNSTLESKYLTFFKDLIKFCHISEPKERVYKILGKKYPKTEEEYKAAFSGDSASAP
FNPELAGKRMKIEISKTWENELSAKGNTAEVWDNLISSNQLPYMAMLRNLSNILKAGV
SDTTHSIVINKICEPKAVENSKMFPLQFFSAIEAVNEAVTKGFKAKKRENMNLKGQIE
AVKEVVEKTDEEKKDMELEQTEEGEFVKVNEGIGKQYINSIELAIKIAVNKNLDEIKG
HTAIFSDVSGSMSTSMSSGAKKYGSVRTCLECALVLGLMVKQRCEKSSFYIFSSPSSQ
CNKCYLEVDPGDELSPSMQKLLQEKGLGGGTDFPYECIDEWTKNKTHTVDNIVILSD
MMIAEGYSDINVRGSSIVNSIKKYKDEVNPNIKIFAVDLEGYKCLNLGDEFNENNYI
KIFGMSDSILKFISAKQGGANMVEVIKNFALQKIGQK

FIGURE 21

1 tcaatactat taattaataa ataaaaaaaa gcaactaca aagaaatgt caaggcgtaa
 61 ctaaaaaaag ccataggctc ctataggcaa tgaacaaat ctgattttg tattacaaa
 121 tctagaagt tacaaaagcc agattgagca ttataagacc tagtagtaat agatcaaaga
 181 ggaggatctc aagcttttaa agttcaaaaa ttaagattag gatggaaact ctggcaacga
 241 tgaatgatga gaagaaaaca actcaataa ataataagaa ttattaagga gagtcaatta
 301 gattaagtag caagttaat tgataaaaa agttgggtct aaggtagaga aagatttgaa
 361 tttgaacgaa gatgaaaaca aaaagaatgg actttctgaa tagcaagtga aagaagagta
 421 attaagaacg attactgaag aataggttaa gtattaaaat ttagtattta acatggacta
 481 ccagttgat tttaatgaga gtgggtggcca tagaagacac agaagagaaa cagattatga
 541 tactgaaaaa tggtttgaaa tatctcatga ccaaaaaat tatgtatcaa ttacgcca
 601 ctaaaagaca tcatattgtt ggtggcttaa agattatttt aataaaaaa attatgatca
 661 tcttaatga agcattaaca gactagaaac tgaagccgaa ttctatgcct ttgatgattt
 721 ttcaaaaaca atcaaaactta ctaataattc ttactagact gtaacatag acgttaattt
 781 tgataataat ctctgtatc tcgacttgc tagattttta ttactactag aaagattcaa
 841 tattttgaat ataagatctt ctatacaag aaattaatat aattttgaga aaattggtga
 901 gctactgaa actatcttcg cagtgtctt ttctatcgc cactacaag gcattcattt
 961 acaagttcct tgcgaagcgt tctaatttt agttaactcc tcatcataa ttacggttaa
 1021 agatagctaa ttataggtat actttttc tacagactta aaattagtg acactaaca
 1081 agtccaagat tattttaagt tcttataaga attccctcgt ttgactcatg taagctagta
 1141 ggctatccca gttagtgtc ctaacgctgt agagaacctc aatgtttac ttaaaaaggt
 1201 caagcatgct aatcttaatt tagtttctat ccctacctaa ttcaatttg atttctactt
 1261 tgttaattta taacatttga aattagagtt tggattagaa ccaaatatt tgacaaaaca
 1321 aaagcttgaa aatctacttt tgagtataa ataatacaaa aatcttaaat ttttaagatt
 1381 aaacttttac acctacgttg ctaagaaac cccagaaaa cagatattaa aacaagctac
 1441 aacaatcaaa aatctcaaaa acaataaaaa tcaagaagaa actcctgaaa cttaaagatga
 1501 aactccaagc gaaagcaca gtggtatgaa atttttgat catctttctg aattaaccga
 1561 gctgaagat ttacgcgtta acttgtaagc tacccaagaa attatgata gcttgacaa
 1621 acttttgatt agatcaaca atttaaagaa gttcaatta agttacaaat atgaatgga
 1681 aaagagtaaa atggatacat tcatagatct taagaatatt tatgaaacct taacaatct
 1741 taaaagatgc tctgttaata tatcaaatc tcatggaac atttctatg aactgacaaa
 1801 taaagattct acttttata aatttaagct gacctaaac taagaattat aacacgctaa
 1861 gtatacttt aagtagaacg aattttaatt taataacgtt aaaagtcaa aaattgaatc
 1921 ttcccaata gaaagcttag aagatattga tagtcttgc aaatctattg ctcttgtaa
 1981 aaattacaa aatgttaata ttatcgccag ttgtctat ccaacaata tttagaaaa
 2041 tctttcaat aagcccaatc ttctatttt caagcaattt gaataattga aaaatttga
 2101 aaatgtatct atcaactgta ttctgatca gcatatactt aattctatt cagaattctt
 2161 agaaaagaat aaaaaataa aagcattcat ttgaaaaga tattatttat tacaatatta
 2221 tcttgattat actaaattat taaaacact tcaatagta cctgaattaa attagttta
 2281 cattaattag caattagaag aattgactgt gagtgaagta cataagtaag tatgggaaa
 2341 ccacaagcaa aaagctttct atgaaccatt atgtgagttt atcaagaat catcctaac
 2401 ccttagcta atagattttg accaaaacac tgaagtgt gactctatta aaaagatttt
 2461 agaattata tctgagtcta agtatcatc ttatttgaga tgaacccta gttaatctag
 2521 cagtttaatt aaatctgaaa acgaagaaat ttaagaactt ctcaagctt ggcacgaaa
 2581 aggtgtttta gtaaagcat actataaatt ccctctatgt ttaccaactg gtacttatta
 2641 cgattacaat tcagatagat ggtgattaat taaatattag tttaaataa tattaataat
 2701 tgaatattc ttgcttatt attgaataa tacatacaat agtattttt agtgtttga
 2761 atatatttta gttatttaatt tcatattttt aagtaaataa ttattttca atcattttt
 2821 aaaaaatcg

FIGURE 22

MSRRNQKKPQAPIGNETNLDFVLQNLEVYKSQIEHYKTQQQIK
EEDLKLLKFKNQDQDGNNGNDDDDDEENNSNKQQELLRRVNQIKQQVQLIKKVGSKVEK
DLNLNEDENKKNGLSEQQVKEEQLRTITEEQVKYQNLVFNMDYQLDLNESGGHRRHRR
ETDYDTEKWFEISHDQKNYVSIYANQKTSYCWWLKDYFNKNNDHNLVNSINRLETEAE
FYAFDDFSQTIKLTNNSYQTVNIDVNFDDNLCILALLRFLLSLERFNILNIRSSYTRN
QYNFEKIGELLETIFAVVFSHRHLQGIHLQVPCEAFQYLVNSSSQISVKDSQLQVYSF
STDCLKLVDTNKVQDYFKFLQEFPRLTHVSQQAIPVSATNAVENLNVLLKKVKHANLNL
VS IPTQFNFDYFVNLQHLKLEFGLEPNILTKQKLENLLLSIKQSKNLKFLRLNFYTY
VAQETSRKQILKQATTIKNLKNNKNQEETPETKDETPSESTSGMKFFDHLSELTELED
FSVNLQATQEIYDSLHKLLIRSTNLKKFKLSYKYEMEKSKMDTFIDLKNIYETLNNLK
RCSVNISNPHGNISYELTNKDSTFYKFKLTLNQELQHAKYTFKQNEFQFNNVKS AKIE
SSSLESLEDIDSLCKSIASCKNLQNVNIIASLLYPNNIQKNPFNKPNLLFFKQFEQLK
NLENVSINCILDQHILNSISEFLEKNKKIKAFILKRYLLQYYLDYTKLFKTLQQLPE
LNQVYINQQLEELTVSEVHKQVWENHKQKAFYEPLCEFIKESSTLQLIDFDQNTVSD
DSIKKILESISESKYHHYLRLNPSQSSSLIKSENEEIQELLKACDEKGVLVKAYYKFP
LCLPTGTYYDYNSDRW

FIGURE 23

MKILFEFIQDKLDIDLQTNSTYKENLKCGHFNGLDEILTTCFAL
PNSRKIALPCLPGDLSHKAVIDHCHYLLTGELYNNVLTFGYKIARNEDVNNSLFCHS
ANVNVTLKGAAWKMFHSLVGTYAFVDLLINYTVIQFNGQFFTQIVGNRCNEPHLPPK
WVQRSSSSSATAAQIKQLTEPVTNKQFLHKLNNSSSFFPYSKILPSSSSIKKLTDLR
EAIPTNLVKIPQRLKVRJNLTLQKLLKRHKRLNYVSILNSICPPLEGTVLDLSHLR
QSPKERVLFIIILQKLLPQEMFGSKKNKGKIIKNLNLSSLPNGYLPFDSLLKKL
RLKDFRWLFISDIWFTKHNFENLNQLAICFISWLFRLIPKIIQTFFYCTEISSTVTI
VYFRHDTWNKLITPFIVEYFKTYLVENNVCRNHNSYTLNHNHSMRIIPKKSNEFR
IIAIPCRGADEEEFTIYKENHKNAIQPTQKILEYLRNKRPTSFTKIYSPTQIADRIKE
FKQRLLKKFNNVLPELYFMKFDVKSCYDSIPRMECMRILKDALKNENGFFVRSQYFFN
TNTGVLKLFNVVNASRVPKPYELYIDNVRTVHLSNQDVINVVEMEIFTALWVEDKCY
IREDGLFQGSSLSAPIVDLVYDDLLEFYSEFKASPSQDTLILKLADDFLIISTDQQQV
INIKKLAMGGFQKYNANRDKILAVSSQSDDDTVIQFCAMHIFVKELEVWKHSSTMN
NFHIRSKSSKGIFRSLIALFNTRISYKTIDTNLNSTNTVLMQIDHVVKNISECYKSAF
KDLSINVTQNMQFHSFLQRIIEMTVSGCPITKCDPLIEYEVRFILNGFLESLSNTS
KFKDNIILLRKEIQHLQAYIYIYIHVN

FIGURE 24

Oxytricha
Euplotes

LCVSYILSSFYYANLEENALQFLRKESMDPEKPETNLLMRLT
LCVSSILSSFYYATLESSLGLRDESMNPENPNVNLMLRLT

FIGURE 25

human
tezi
EST2
p123

Motif 0

AKFLHWLMSVYVVELLRSPFFYVTETTPQKNR

ISEIEWLVLGKRSNAXMCLSDFEKRKQIFAEFIYWLNSPIIPILQSFFYITESDLRNR
LKDFRWLFISD--IWFTKHNFNENLNQLAICFISWLPRQLIPKIIQTFFYCTEISSTVT-
TREISWMQVET-SAKHPYYFDHEN-IYVLWKLLRWIFEDLVVSLIRCFFYVTEQQKSYSK
..*..*..*..*..*..*

Motif 1

human
tezi
EST2
p123

LFFYRKSVWSKLQSIGIRQHLKRVQLRDVSEAEVRQHREARPALLTSRLRFIPKP--DGL
TVYFRKDIWKLRCRPI-TSMKMEAFKINENNVRMDTQK-TTLPPAVIRLLPKK--NTP
IVYFRHDTWNKLITPFI VEYFKTYLVENNVCRNHNSTLS--NPNHSMKRIIPKKSNEF
TYYYRKNIWDVIMKMSI-ADLKKETLAEVQKEVEEWKKS-LGFAPGKLRLIPKK--TTF
..*..*..*..*..*..*

Motif 2

human
tezi
EST2
p123

RPIVNMDYVVGARTFRREKRAERLTSRVKALF-SVLNYERA
RLITN-LRKRFLIKMGSNKKMLVSTNQTLRPVASILKHLINEESSGIPFKLEVYMKLLTF
RIIAIPCRGADEEEFTIYKENHKNAIQPTQKILEYLRNKRPTSFTKIYSPTQIADRIKEF
RPIMTFNKKIVNSDRKTTKLTNTKLLNSHMLKTLKN-RMFKDPPGFAVFNYDDVMKKY
....*..*..*..*

Motif 3 (A)

tezi
EST2
p123

KKDLLKHRMFGR-KKYFVRIDIKSCYDRIKQDLMFRIVKR-KLKDPEPVIRKYATIHATS
XQRLKKKFNNVLPelyfMKFDVKSCYDSIPRMECMRILKD-ALKNENGFFVRSQYFPNTN
EEFVCKWKQVGQPKLFFATMDIEKCYDSVNREKLSTFLKTTKLLSSDFWIMTAQILKRKN
..*..*..*..*..*..*

FIGURE 26

ATTTATACTCATGAAAATCTTATTCGAGTTCATTCAAGACAAGCTTGACATTGATCTACA
 GACCAACAGTACTTACAAAGAAAATTTAAAATGTGGTCACTTCAATGGCCTCGATGAAAT
 TCTAACTACGTGTTTCGCACTACCAAATTCAGAAAAATAGCATTACCATGCCTTCCTGG
 TGACTTAAGCCACAAAGCAGTCATTGATCACTGCATCATTTACCTGTTGACGGGCGAATT
 ATACAACAACGTACTAACATTTGGCTATAAAATAGCTAGAAATGAAGATGTCAACAATAG
 TCTTTTTTTGCCATTCTGCAAATGTTAACGTTACGTTACTGAAAGGCGCTGCTTGAAAAAT
 GTTCCACAGTTTGGTCGGTACATACGCATTTCGTTGATTTATTGATCAATTATACAGTAAT
 TCAATTTAATGGGCAGTTTTTCACTCAAATCGTGGGTAAACAGATGTAACGAACCTCATCT
 GCCGCCCCAAATGGGTCCAACGATCATCCTCATCATCCGCAACTGCTGCGCAAATCAAACA
 ACTTACAGAACCAGTGACAAATAAACAAATTCTTACACAAGCTCAATATAAATTCCTCTTC
 TTTTTTTCTTATAGCAAGATCCTTCCTTCATCATCATCTATCAAAAAGCTAACTGACTT
 GAGAGAAGCTATTTTTCCCACAAATTTGGTTAAAATTCCTCAGAGACTAAAGGTACGAAT
 TAATTTGACGCTGCAAAAGCTATTAAAGAGACATAAGCGTTTGAATTACGTTTCTATTTT
 GAATAGTATTTGCCCCACCATTTGGAAGGGACCGTATTGGACTTGTGCGATTTGAGTAGGCA
 ATCACCAAAGGAACGAGTCTTGAAATTTATCATTGTTATTTTACAGAAGTTATTACCCCA
 AGAAATGTTTGGCTCAAAGAAAAATAAAGGAAAAATTATCAAGAATCTAAATCTTTTATT
 AAGTTTACCCTTAAATGGCTATTTACCATTTGATAGTTTGTGAAAAAGTTAAGATTAAA
 GGATTTTCGGTGGTTGTTTCATTTCTGATATTTGGTTTACCAAGCACAAATTTGAAAACCTT
 GAATCAATTGGCGATTTGTTTCATTTCTGGCTATTTAGACAACTAATTCCTAAAATTAT
 ACAGACTTTTTTTTACTGCACCGAAATATCTTCTACAGTGACAATTGTTTACTTTAGACA
 TGATACTTGGAATAAACTTATCACCCCTTTTATCGTAGAATATTTTAAGACGTACTTAGT
 CGAAAACAACGTATGTAGAAACCATAATAGTTACACGTTGTCCAATTTCAATCATAGCAA
 AATGAGGATTATACCAAAAAAAGTAATAATGAGTTCAGGATTATTGCCATCCCATGCAG
 AGGGGCGAGACGAAGAAGAATTCACAATTTATAAGGAGAATCACAAAAATGCTATCCAGCC
 CACTCAAAAAATTTTAGAATACTTAAGAAACAAAAGGCCGACTAGTTTTACTAAAATATA
 TTCTCCAACGCAAAATAGCTGACCGTATCAAAGAATTTAAGCAGAGACTTTTAAAGAAATT
 TAATAATGTCTTACCAGAGCTTTATTTTATGAAATTTGATGTCAAATCTTGCTATGATTC
 CATACCAAGGATGGAATGTATGAGGATACTCAAGGATGCGCTAAAAAATGAAAATGGGTT
 TTTTCGTTAGATCTCAATATTTCTTCAATAACCAATACAGGTGTATTGAAGTTATTTAATGT
 TGTTAACGCTAGCAGAGTACCAAAACCTTATGAGCTATACATAGATAATGTGAGGACGGT
 TCATTTATCAAATCAGGATGTTATAAACGTTGTAGAGATGGAAATATTTAAAACAGCTTT
 GTGGGTTGAAGATAAGTGCTACATTAGAGAAGATGGTCTTTTTTCAGGGCTCTAGTTTATC
 TGCTCCGATCGTTGATTTGGTGTATGACGATCTTCTGGAGTTTTATAGCGAGTTTAAAGC
 CAGTCCTAGCCAGGACACATTAATTTTAAAACCTGGCTGACGATTTCTTTATAATATCAAC
 AGACCAACAGCAAGTGATCAATATCAAAAAGCTTGCCATGGGCGGATTTCAAAAATATAA
 TGCGAAAGCCAATAGAGACAAAATTTTAGCCGTAAGCTCCCAATCAGATGATGATACGGT
 TATTCAATTTTGTGCAATGCACATATTTGTTAAAGAATTGGAAGTTTGGAACATTCAAG
 CACAATGAATAATTTCCATATCCGTTTGAATCTAGTAAAGGGATATTTCGAAGTTTAAAT
 AGCGCTGTTTAACTAGAAATCTCTTATAAAACAATTGACACAAATTTAAATTCAACAAA
 CACCGTTCTCATGCAATTGATCATGTTGTAAAGAACATTTCGGAATGTTATAAATCTGC
 TTTTAAGGATCTATCAATTAATGTTACGCAAAATATGCAATTTTATTCTGTTCTTACAACG
 CATCATTGAAATGACAGTCAGCGGTTGTCCAATTACGAAATGTGATCCTTTAATCGAGTA
 TGAGGTACGATTCACCATATTGAATGGATTTTTTGGAAGGCCTATCTTCAAACACATCAA
 ATTTAAAGATAATATCATTCTTTTGAGAAAGGAAATTCAACACTTGCAAGC

FIGURE 27

AKFLHWLMSVYVVELLRSFFYVTETTFQKNRLFFYRKS VWSKLQSIGIRQHLKR
VQLRDVSEAEVRQHREAR PALLTSRLRFIPKPDGLRPIVNMDYVVGARTFRREKR
AERLTSRVKALFSVLNYERA

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FIGURE 28

GCCAAGTTCCTGCACTGGCTGATGAGTGTGTACGTCGTCGAGCTGCTCAGGTC
TTTCTTTTATGTCACGGAGACCACGTTTCAAAGAACAGGCTCTTTTCTACC
GGAAGAGTGTCTGGAGCAAGTTGCAAAGCATTGGAATCAGACAGCACTTGAA
GAGGGTGCAGCTGCGGGACGTGTCGGAAGCAGAGGTCAGGCAGCATCGGGA
AGCCAGGCCCCGCCCTGCTGACGTCCAGACTCCGCTTCATCCCCAAGCCTGACG
GGCTGCGGCCGATTGTGAACATGGACTACGTCGTGGGAGCCAGAACGTTCCG
CAGAGAAAAGAGGGCCGAGCGTCTCACCTCGAGGGTGAAGGCACTGTTCAGC
GTGCTCAACTACGAGCGGGCGCG

FIGURE 29

MTEHHTPKSRILRFLENQYVYLCTLN DYVQLVLRGSPASSYSNICERLRSDVQTSFSIFLHSTVVGF
DSKPDEGVQFSSPKCSQSELIANVVKQMFDESERRRNLMMKGFSMNHEDFRAMHVNGVQNDLV
STFPNYLISILESKNWQLLEIIGSDAMHYLLSKGSIFEALPNDNYLQISGIPLFKNNVFEETVSKKRK
RTIETSITQNK SARKEVSWNSISIRFSIFYRSSYKKFKQDLYFNLHSICDRNTVHMLQWIFPRQFG
LINAQVQQLHKVIPLVSQSTVVPKRLK VYPLIEQTAKRLHRISLSKVYNHYCPYIDTHDDEKILS
YSLKPNQVFAFLRSILVRVFPKLIWGNQRIFEIILKDLETFLKLSRYESFSLHYLMSNIKISEIEWLVL
GKR SNAKMCLSDFEKRKQIFAEFIYWL YNSFIIPILQSFFYITESDLRNRTVYFRKDIWKLLCRPFIT
SMKMEAFEKINENNVRMDTQKTTLPPA VIRLLPKKNTFRLITNLRKRFLIKMGSNKKMLVSTNQT
LRPVASILKHLNEESSGIPFNLEVYMKLLTFKKDLLKHRMFGRKKYFVRIDIKSCYDRIKQDLMFR
IVKKKLDPEFVIRKYATIHATSDRATKNFVSEAFSYFDMVPFEKVVQLLSMKTSDTLFVDFVDY
WTKSSSEIFKMLKEHLSGHIVKIGNSQYLQKVGIPQGSILSSFLCHFYMEDLIDEYLSFTKKKGSVL
LRVVD DFLFITVNKKDAKKFLNLSLRGFEEKHNFSTSLEKTVINFENSNGIINNTFFNESKKRMPFFG
FSVNMRLDTLLACPKIDEALFNSTSVELTKHMGKSFFYKILRSSLASFAQVFIDITHNSKFNSCCN I
YRLGYSMCMRAQAYLKR MKDIFIPQRMFITDLLNVIGRKIWKKLAEILGYTSRRFLSSAEVKWLFC
LGMRDGLKPSFKYHPCFEQLIYQFQSLTDLIKPLRPVLRQVLFHRRJAD

FIGURE 30

ggtaccgatttactttctttctcataagctaattgcttctcgaacgctcctaaatctctggaaatattttacaagaactcaataacaataccaagtcaaattccaatatgaagg
 tgtatttagtgatcgataatatttctatttaccggtcgttaccagataaggacaaaaagaacaacttcttccccctaaagacttttacttttataatttacttttcaaatatatttcg
 ggttcgcttacttttaacgttggtactgttttagctgctacttctagccaaccgctgttttctaccccgctattggatatagctcttggagtagctcacagaatccttcaaatctt
 ctgatgagactatattagattacagtcggtcgtatcttcaatggagccttacacttttagatgagtcacgctgcatgattggagatttggatcatccaacgtttgcttg
 aaaaggttgataattattgcaaatcatgcttagtggtgtaacccgcaaggtttttgatgctgacacgcttagcatgattgagatattcaaaaatttctatccactacaa
 ctctttaacgcggtttattttctatttctatttctatggttccaaatgatcatctgattaggctttttcgttttactcctggaatcgtaccttttctacttccccctaatg
 aataatctaaattagtttgcctataattgatagtagtagaaagattggtgattctactcgtgtaattgtattagtttaaagatactttgcaaaacatttattagctatcattatataaaa
 aaaatcctataattataatattaatcaatatttgcggtcactatttttaaaacgttatgatcagtaggacactttgcatatatatagttatgcttaattggttacttgaacttgcAT
 GACCGAACACCATACCCCCAAAAGCAGGATTCTTCGCTTTCTAGAGAATCAATATGTATACCTATGTA
 CCTTAAATGATTATGTACAACCTTGTGAGAGGGTCGCCGGCAAGCTCGTATAGCAATATATGCGAA
 CGCTTGAGAAGCGATGTACAAACGTCCTTTTCTATTTTCTTCATTGACTGTAGTCGGCTTCGACAGT
 AAGCCAGATGAAGGTGTTCAATTTTCTTCTCCAAAATGCTCACAGTCAGAGGtatatatatttttggattttttctattc
 ggatagctaatatatggcgCTAATAGCGAATGTTGTAAAACAGATGTTTCGATGAAAGTTTTGAGCGTCGAAGGA
 ATCTACTGATGAAAGGGTTTTCCATGtaaggatttcaattgtgaaatatttactcgtcaattactgttcaagagatttatttaaccgataaagAA
 TCATGAAGATTTTCGAGCCATGCATGTAAACGGAGTACAAAATGATCTCGTTTCTACTTTTCTAATTA
 CCTTATATCTATACTTGAGTCAAAAAATTGGCAACTTTTGTAGAAATgtaataaccggttaagattgtgcgcaacttgaaca
 agactgacaagtatagTATCGGCAGTGATGCCATGCATTACTTATTATCCAAAGGAAGTATTTTGGAGGCTCTTC
 CAAATGACAATTACCTTCAGATTTCTGGCATAACCACTTTTAAAAATAATGTGTTTGAGGAACTGTGT
 CAAAAAAGAAAGCGAACCATTGAAACATCCATTACTCAAAATAAAAGCGCCCGCAAAGAAGTTTC
 CTGGAATAGCATTTCATTAAGTAGGTTTAGCATTTTTACAGGTCATCCTATAAGAAGTTTAAGCAAGgt
 aactaactgttatcttcataactaatttagATCTATATTTTAACTTACACTCTATTTGTGATCGGAACACAGTACACATG
 TGGCTTCAATGGATTTTCCAAGGCAATTTGGACTTATAAACGCATTTCAAGTGAAGCAATTGCACAA
 AGTGATTCCACTGGTATCACAGAGTACAGTTGTGCCCAAACGTCCTAAAGGTATACCCTTTAATTGA
 ACAACAGCAAAGCGACTCCATCGTATTTCTCTATCAAAAGTTTACAACCATTATTGCCCATATATTGA
 CCCCACGATGATGAAAAAATCCTTAGTTATTCTTAAAGCCGAACCAGGTGTTTGCCTTCTTCGATC
 CATTCTGTTTCGAGTGTTTCTAAATTAATCTGGGGTAACCAAAGGATATTTGAGATAATATTAAGg
 tattgtataaaattattaccactaacgattttaccagACCTCGAAACTTTCTTGAAATTATCGAGATACGAGTCTTTTAGTTTAC
 ATTATTTAATGAGTAACATAAAGGtaaatatgccaaatttttaccattaattaacaatcagATTTCAGAAATTGAATGGCTAGT
 CCTTGGAAGAAAGGTCAAATGCGAAAAATGTGCTTAAGTGATTTTGAGAAACGCAAGCAAATATTTGCGG
 AATTCATCTACTGGCTATACAATTCGTTTATAATACCTATTTTACAATCTTTTTTTATATCACTGAATC
 AAGTGATTTACGAAATCGAACTGTTTATTTTAGAAAAGATATTTGAAACTCTTGTCGCGACCTTTAT
 TACATCAATGAAAATGGAAGCGTTTGAAAAAATAAACGAGgtattttaagatttttgcataatattttcagAACAA
 TGTTAGGATGGATACTCAGAAAACCTTTGCCTCCAGCAGTTATTCGTCTATTACCTAAGAAGAATAC
 CTTTCGTCTCATTACGAATTTAAGAAAAAGATTCTTAATAAAAGtattaatttttggatcaatgtactttacttctattatttag
 cagATGGGTTCAAACAAAAAATGTTAGTCAGTACGAACCAAACCTTTACGACCTGTGGCATCGATACTG
 AAACATTTAATCAATGAAGAAAGTAGTGGTATTCATTTAACTTGGAGGTTTACATGAAGCTTCTTACT
 TTTAAGAAGGATCTTCTTAAGCACCGAATGTTTGgttaattatataatgcgcatcctcattattaattttcagGCGTAAGAAG
 TATTTTGTACGGATAGATATAAAATCCTGTTATGATCGAATAAAGCAAGATTTGATGTTTCGGATTGTT
 AAAAAGAACTCAAGGATCCCGAATTTGTAATTCGAAAGTATGCAACCATACATGCAACAAGTGACCG
 AGCTACAAAAAATTTGTTAGTGAGGCGTTTTCTATTgtaagtttatttttattggaatttttaacaaattcttttagTTGATAT
 GGTGCTTTTGAAAAAGTCGTGCAGTTACTTTCTATGAAAACATCAGATACTTTGTTTGTGATTGTTGT
 GGATTATTGGACCAAAAGTTCTTCTGAAATTTTTAAAAATGCTCAAGGAACATCTCTCTGGACACATTGT
 TAAAGgtataccaattgtgaattgtaataacactaatgaaactagATAGGAAATTCTCAATACCTTCAAAAAGTTGGTATCCCTC
 AGGGCTCAATTCTGTCTATCTTTTGTGTCAATTTCTATATGGAAGATTTGATTGATGAATACCTATCGTT
 TACGAAAAAGAAAGGATCAGTGTTGTTACGAGTAGTCGACGATTTCTCTTTATAACAGTTAATAAAA
 AGGATGCAAAAAAATTTTGAATTTATCTTTAAGAGgtgagttgctgtcattcctaagttctaaccgttgaagGATTTGAGAA
 ACACAATTTTCTACGAGCCTGGAGAAAACAGTAATAAATTTGAAAAATAGTAATGGGATAATAACA
 ATACTTTTTTAAATGAAAGCAAGAAAAGAAATGCCATTCTTCGGTTTCTCTGTGAACATGAGGTCTCTTG
 ATACATTGTTAGCATGTCCTAAAATTGATGAAGCCTTATTTAACTCTACATCTGTAGAGCTGACGAAAC
 ATATGGGGAAATCTTTTTTTTACAAAATTTCTAAAGtatactgtgtaactgaataatagctgacaataatcagATCGAGCCTTGC
 ATCCTTTGCACAAGTATTTATTGACATTACCCACAATTCAAAATTTCTGCTGCAATATATATAG
 GCTAGGATACTCTATGTGTATGAGAGCACAAGCATACTTAAAAAGGATGAAGGATATATTTATCCCC
 AAAGAATGTTTATAACGGgtgagttacttatttaactgaaggtcatttaaaccttagATCTTTTGAATGTTATTGGAAGAAAA
 ATTTGGAAAAAGTTGGCCGAAATATTAGGATATACGAGTAGGCGTTTCTTGTCTCTGCAGAAGTCAA

FIGURE 30 (cont.)

ATGgtacgtgtcgggtctcgagacttcagcaatattgacacatcagGCTTTTTTGTCTTGAATGAGAGATGGTTTGAAACCTCTT
TCAAATATCATCCATGCTTCGAACAGCTAATATACCAATTTTCAGTCATTGACTGATCTTATCAAGCCGC
TAAGACCAGTTTTGCGACAGGTGTTATTTTTACATAGAAGAATAGCTGATTAAgttcatttcaattattatatacatcctt
tattactggtgtcttaacaatattattactaagtatagctgacccccaagcaagcatactataggatttctagtaaagtaaaattaatctcgttattagtttgattgactgtctt
atccttatacttttaagaagattgacagtgggtgctgactactgccacatgccattaacgggagtggttaacattaaaagtaatacatgaggctaattcctttcatttag
aataaggaaagtgttttctataatgaataatgccgcactaatgcaaaaagacgaagattatcttctaaacaagggggattaagcataatccgaaggaaaagagagtaatat
accagtggtgtgaagaaagcaaggataatttgaacaagcttctgcagatgacaggctaaatttggtagccgaatttggtaaaagcccaggttatccatggtggccg
gccttgctactgagacgaaaagaaactaaggatagtttgaataactaatagctcatttaattgtcttatataaggtttgttttctgacttcaatttgcattgggtgaaaagaaata
gtgttaagccattattggattccgaaatagccaaatttcttgggtcctcaaagcggaagtctaaagaacttattgaagcttatgaggcttcaaaaactcctcctgattaaaggag
gaatcttccaccgatgaggaaatggatagcttatcagctgctgaggagaagcctaatttttgcaaaaagaaaatatcatgggagacatcttgaatcagatgcgga
gagtatctccagcggatccttgatgtcaataacttctatttctgaaatgtatggtcctactgtcgcttcgacttctcgtagctctacgcagttaagtaccaaaggtacc

FIGURE 31

| | | |
|---------------------|--|-----|
| EST2 pep | FFYCTEISST VTIVYFRHDT WN----KLIT P-----FIVE YFK-TYLVEN | 40 |
| Euplotes pep | FFYVTEQOKS YSKTYYYRKN IWDVI-MKMS IAD---LKK ETLA--EVQE | 43 |
| Trans of tetrahymen | -----KHKE GSQIFYRKP IWKLVSCLTI VKVRIQFSEK NKQMKNFYQ | 44 |
| Consensus | FFY.TE..K. .S..YYRK. IW...-KL.. ----F..KV.. | 50 |
| EST2 pep | NVCRNHNSY- ----- TLSNFNHSTV FRIIPKSNNE FRITAIPCRG | 79 |
| Euplotes pep | KEVEEWKKS L ----- GFAPGKQ FRIIPKITT FRHIMTFNKK | 78 |
| Trans of tetrahymen | KIQLEENLE KVEEKLIPED SFQKYPQK FRIIPKGS-- FRHIMTFLRK | 92 |
| Consensus | K...E..... -----F..GKE FRIIPK...-- FRHIMTF.RK | 100 |
| EST2 pep | ADEESFTIYK ENHKNAIQPT QKILEYRNK RPTSFTKIYS PTQIADRIKE | 129 |
| Euplotes pep | IVNSDRKTTK LTTNTKLLNS HLMLKTEKN- -----RMFK -DPFGFAVFN | 120 |
| Trans of tetrahymen | DKQKNIK--- LNLNQILMDS QLVFRNKKD- -----ML-G -QKIGYSVFD | 130 |
| Consensus |K..K LN.N..L..S QL.L. LKN- -----... -..IG..VF. | 150 |
| EST2 pep | FKQRLKKEN NVL----- FRIYFMKFD VKSCYD | 157 |
| Euplotes pep | YD-DVMKAYE EFVCKWKQVG QPKFFAIMD IEKCYD | 155 |
| Trans of tetrahymen | NK-QISEKFA QFIEKWQKNG RPKLYYVTL- ----- | 158 |
| Consensus | .K-...KKF. .F..KWK..G .G.LYF.T.D ...CYD | 186 |

FIGURE 32

S-1: FFY VTE TTF QKN RLF FYR KSV WSK
S-2: RQH LKR VQL RDV SEA EVR QHR EA
S-3: ART FRR EKR AER LTS RVK ALF SVL NYE

A-1: AKF LHW LMS VYV VEL LRS FFY VTE TTF Q
A-2: LFF YRK SVW SKL QSI GIR QHL KRV QLR DVS
A-3: PAL LTS RLR FIP KPD GLR PIV NMD YVV

FIGURE 33

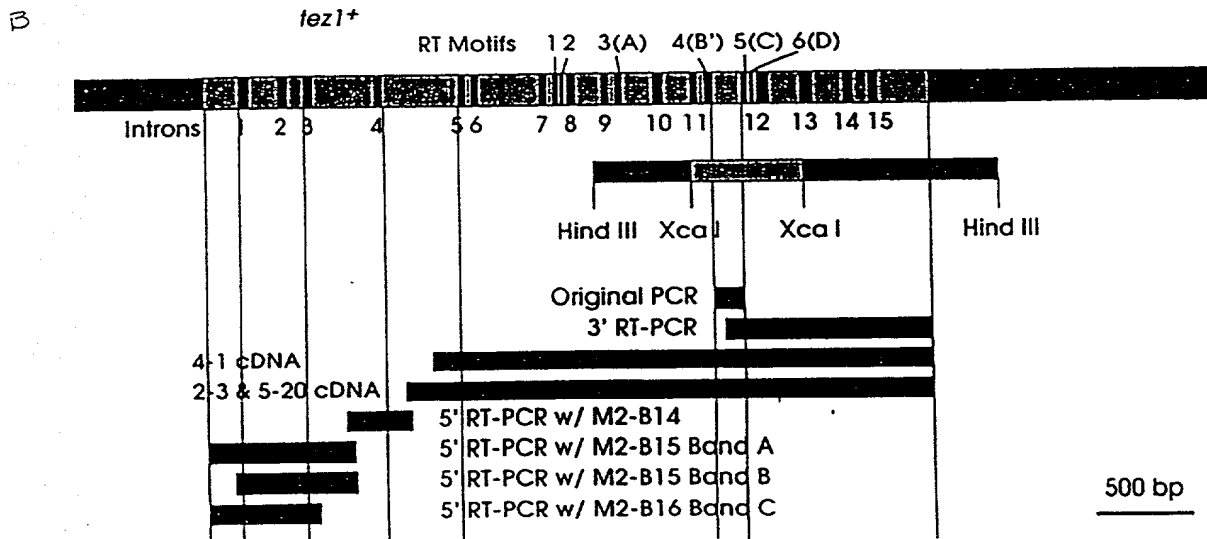
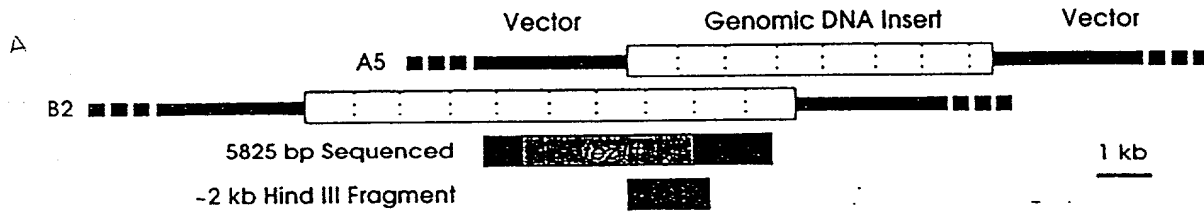


FIGURE 34

Poly 4

| | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|--------|
| | t | | t | | c | | | |
| | t | a | a | g | c | c | t | c |
| 5'- | cag | acc | aaa | gga | att | cca | taa | gg -3' |
| | Q | T | K | G | I | P | Q | G |

4 (B')

5 (c')

| | | | | | | | | |
|-----|-----|-----|-----|-----|-----|---------------|-----|-----|
| | D | D | Y | L | L | I | T | |
| 3'- | ctg | ctg | atg | gag | gag | tag | tgg | -5' |
| | a | a | a | a | a | a | a | |
| | | | t | t | | t | t | |
| | | | | | | c | c | |
| | | | | | | <u>Poly 1</u> | | |

FIGURE 35

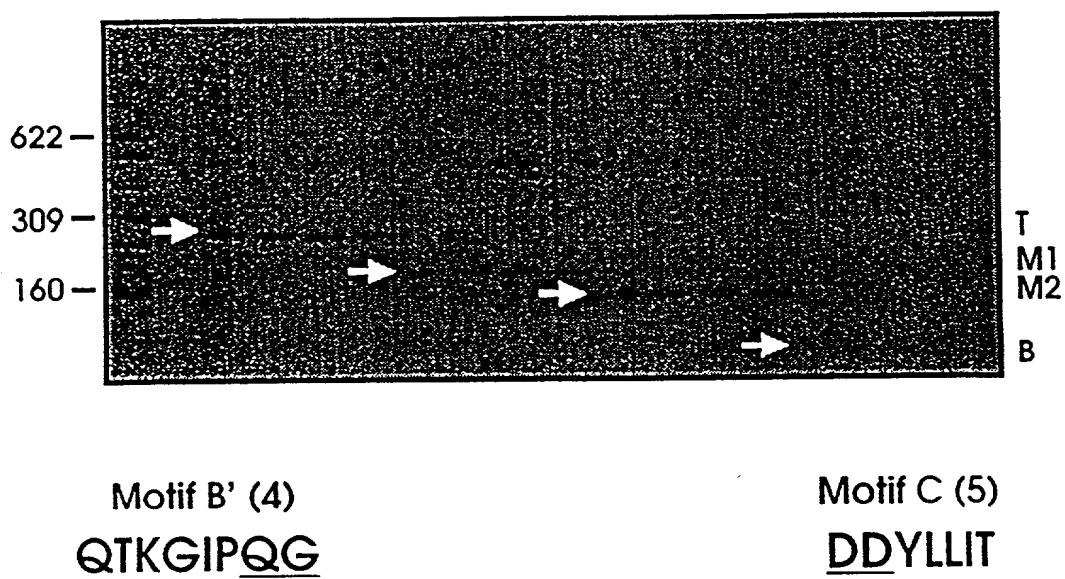


FIGURE 36

PCR Product M2 showed Reasonable Match with Other Telomerase Proteins

| | |
|---------|---|
| Ot | LCVSYILSSFYYANLEENALQFLRKESMDPEKPETNLLMRLT |
| Ea_p123 | KGIPQGLCVSSILSSFYYATLEESSLGFLRDESMNPENPNVNLLMRLTDDYLLIT |
| Sp_M2 | SILSSF LCHFYMEDLIDEYLSFTKKK-----GSVLLRVV |
| Sc_p103 | DGLFQGSSLSAPIVDLVYDDLLEFYSEFKASPS-----QDTLILKLADDFLIIS |
| | . * . * . * |

Q K V G I P Q G
caa aaa gtt ggt atc cct cag gg..... <---Actual Genomic Sequence.

Poly 4
t t c
t a a g c c t c g
cag acc aaa gga att cca taa gg ---->

ag acc aaa gga att cca tca ggC TCA ATT CTG TCA TCT TTT TTG TGT CAT TTC TAT ATG
tc tgg ttt cct taa ggt agt ccG AGT TAA GAC AGT AGA AAA AAC ACA GTA AAG ATA TAC

K G I P S G S I L S S F L C H F Y M

GAA GAT TTG ATT GAT GAA TAC CTA TCG TTT ACG AAA AAG AAA GGA TCA GTG TTG TTA CGA
CTT CTA AAC TAA CTA CTT ATG GAT AGC AAA TGC TTT TTC TTT CCT AGT CAC AAC AAT GCT

E D L I D E Y L S F T K K K G S V L L R

GTA GTC gac gac tac ctc ctc atc acc
CAT CAG ctg ctg atg gag gag tag tgg

V V D D Y L L I T

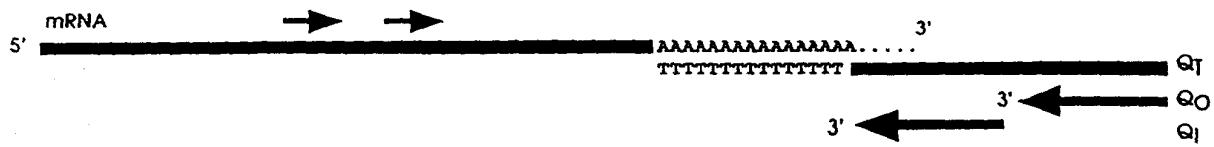
<---- ctg ctg atg gag gag tag tgg
a a a a a a a a
t t t t
c c

Poly 1

.....gac gat ttc ctc ttt ata aca..... <---Actual Genomic Sequence.
D D F L F I T

FIGURE 37

3' RT PCR Strategy



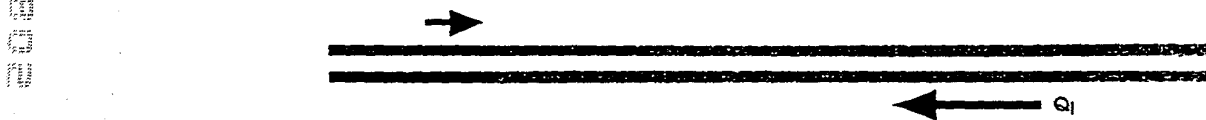
1. Synthesis of cDNA with Q_T Primer.



2. First Round PCR Using Outside Primer and Q_O Primer.



3. Second Round PCR Using Inside Primer and Q_I Primer.



4. Sequence Second Round PCR Products Using Inside Primer or Q_I Primer.

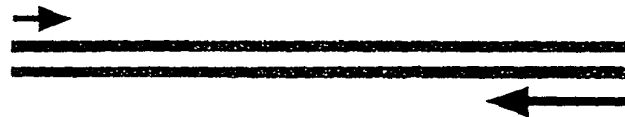


FIGURE 38

A

-Size Selected Libraries from P. Nurese

- 3 ~ 4 kb
- 5 ~ 6 kb
- 7 ~ 8 kb
- 11 ~ 12 kb

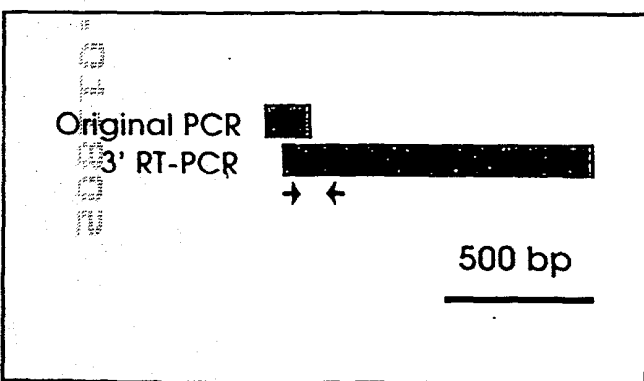
-Libraries from J.A. Wise

- Sau 3a Partial Digest
- Hind III Partial Digest

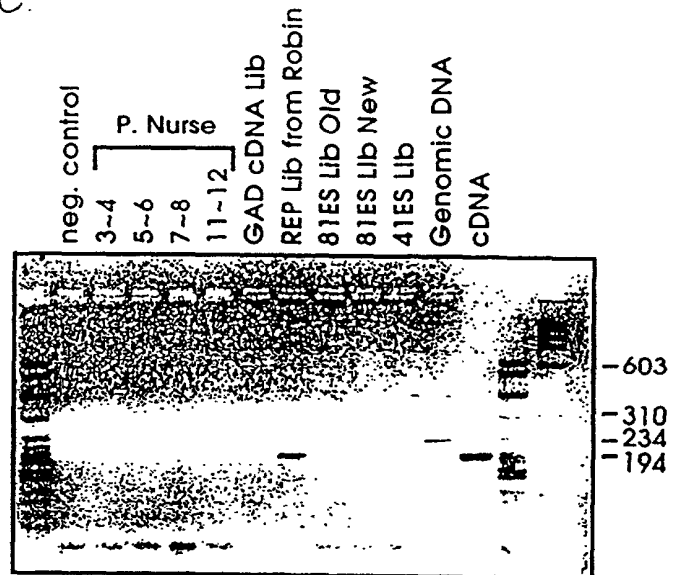
cDNA Libraries

- GAD (Gal Activation Domain) Library
- REP Library from R. Allshire
- REP81ES Library (old)
- REP81ES Library (new)
- REP41ES Library

B.



C.



D.

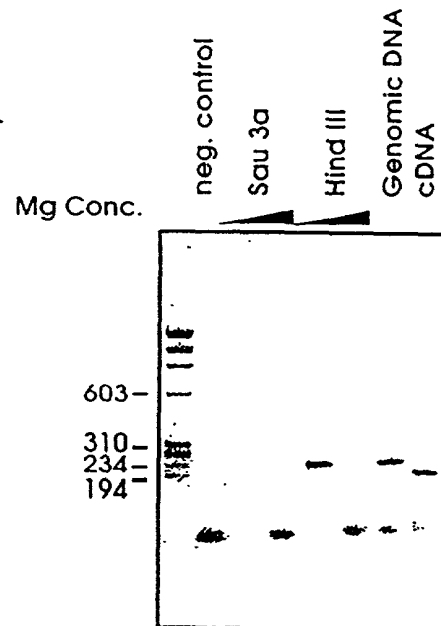


FIGURE 39

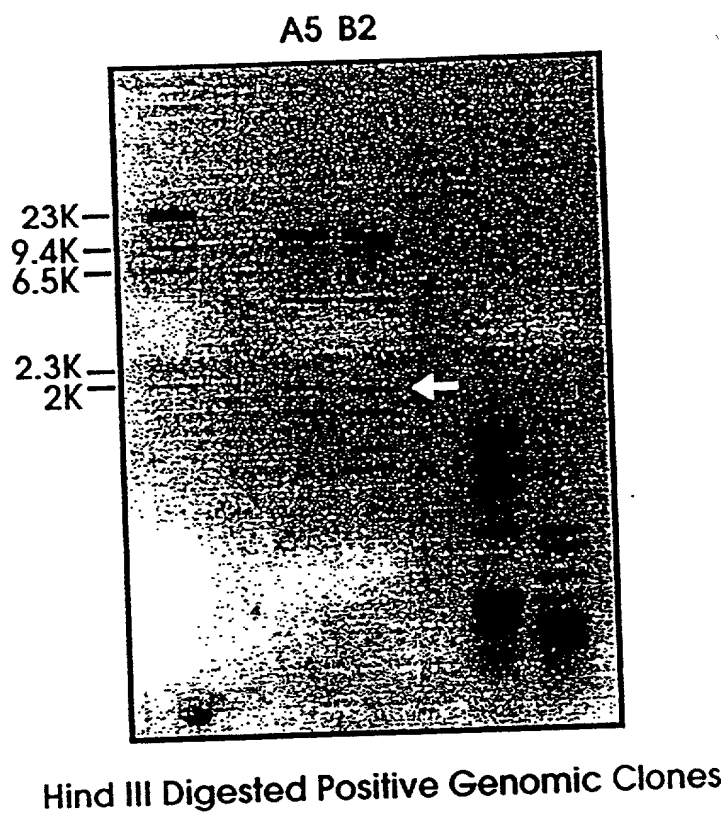
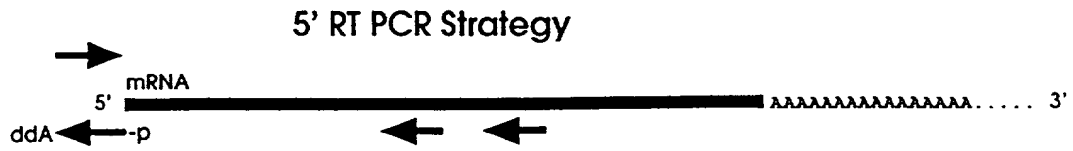


FIGURE 40



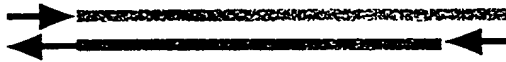
1. Synthesis of cDNA with Specific Downstream Primer.



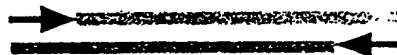
2. Ligate Oligo with 5'-P and blocked 3' to cDNA using T4 RNA Ligase.



3. First Round PCR



4. Second Round PCR



Motif 0

| | | |
|---------|---------|---|
| Motif 1 | Motif 2 | K |
| h h n K | h R h | R |

S.p. Tez1p AVIRLLPKK--NTFRLITN-LRKRF ... (61) ...
S.c. Est2p SKMRIIPKKSNNEFRIIAIPCRGAD ... (62) ...
E.a. p123 GKRLRIPKK--TTFRPIMTFNKKIV ... (61) ...

| | | |
|-------|-------|----|
| Motif | 3 (A) | AF |
| h | hDh | GY |

S.p. Tez1p KKYFVRIDIKSCYDRIKQDLMFRIVK ... (89) ...
S.c. Est2p ELYFMKFDVKSCYDSIPRMECMRILK ... (75) ...
E.a. p123 KLFFATMDIEKCYDSVNREKLSTFLK ... (107) ...
* * * *

Motif 4 (B')

| | | hPQG | pP | hh | h | |
|------|-------|----------------------------------|----|----|---|--------------|
| S.p. | Tez1p | YLQKVGIPQGSILSSFLCHFYMEDLIDEYLSF | | | | ... (6) ... |
| S.c. | Est2p | YIREDGLFQGSSLSAPIVDLVYDDLLEFYSEF | | | | ... (8) ... |
| E.a. | p123 | YKQTKGIPQGLCVSSILSSFYYATLEESSLGF | | | | ... (14) ... |
| | | * * * | * | | * | |

Y Motif 5(C)

| | t. F DDhhh | Gh h cK h | |
|------------|--|-----------|-------|
| S.p. Tez1p | VLLRVVDDFLFITVNKKDAKKFLNLSLRGFEKHNFSTSLKTVINFENS | | (205) |
| S.c. Est2p | LILKLADDFLIISTDQQQVINIKKLAMGGFQKYNAKANRDKILAVSSQS | | (173) |
| E.a. p123 | LLMRLTDDYLLITTOENNAVLFIIEKLINVSRENGFKFNMKKLQTSFPLS | | (209) |
| | * * * * | * * * | |

6

A

Sp_Trip1 1-MTENHTPKSRILRFLNENYVYLCT 2
Sc_East2p 1-MTENHTPKSRILRFLNENYVYLCT 2
Ea_Trip2 1-MTENHTPKSRILRFLNENYVYLCT 2
Sp_Trip1 24 LNNVLYLVGSPALPASHNICRERSDVSTYS 27
Sc_East2p 24 LNNVLYLVGSPALPASHNICRERSDVSTYS 27
Ea_Trip2 24 LNNVLYLVGSPALPASHNICRERSDVSTYS 27
Sp_Trip1 34 FIKATYVYVQKPDGQGVDFSPKCKOAN 37
Sc_East2p 34 FIKATYVYVQKPDGQGVDFSPKCKOAN 37
Ea_Trip2 34 FIKATYVYVQKPDGQGVDFSPKCKOAN 37
Sp_Trip1 41 YKQFTDQEFERRRERKMKSSMHHNDFRHH 121
Sc_East2p 41 YKQFTDQEFERRRERKMKSSMHHNDFRHH 121
Ea_Trip2 41 YKQFTDQEFERRRERKMKSSMHHNDFRHH 121
Sp_Trip1 123 VNGCQGVVFFFLYLISIERKMKOLLEI 126
Sc_East2p 123 VNGCQGVVFFFLYLISIERKMKOLLEI 126
Ea_Trip2 123 VNGCQGVVFFFLYLISIERKMKOLLEI 126
Sp_Trip1 134 TDYVVDIIFLYTIFNGOFFYVIRKCHPE 137
Sc_East2p 134 TDYVVDIIFLYTIFNGOFFYVIRKCHPE 137
Ea_Trip2 134 TDYVVDIIFLYTIFNGOFFYVIRKCHPE 137
Sp_Trip1 146 HVELLEERKKTERTSYTHN-----SARKS 234
Sc_East2p 146 HVELLEERKKTERTSYTHN-----SARKS 234
Ea_Trip2 146 HVELLEERKKTERTSYTHN-----SARKS 234
Sp_Trip1 234 YNSISISRFRIFRNSRYKQDQVYELMLICD 237
Sc_East2p 234 YNSISISRFRIFRNSRYKQDQVYELMLICD 237
Ea_Trip2 234 YNSISISRFRIFRNSRYKQDQVYELMLICD 237
Sp_Trip1 246 LNTYNNMLWVGRQFGLAPQVYKHKYPL 249
Sc_East2p 246 LNTYNNMLWVGRQFGLAPQVYKHKYPL 249
Ea_Trip2 246 LNTYNNMLWVGRQFGLAPQVYKHKYPL 249
Sp_Trip1 258 YS-----QSTYVPRLLLYTPLEQATLH 315
Sc_East2p 258 YS-----QSTYVPRLLLYTPLEQATLH 315
Ea_Trip2 258 YS-----QSTYVPRLLLYTPLEQATLH 315
Sp_Trip1 315 LSKYVYVYVYVYVYVYVYVYVYVYVYVY 318
Sc_East2p 315 LSKYVYVYVYVYVYVYVYVYVYVYVYVY 318
Ea_Trip2 315 LSKYVYVYVYVYVYVYVYVYVYVYVYVY 318
Sp_Trip1 324 VYVYVYVYVYVYVYVYVYVYVYVYVYVY 327
Sc_East2p 324 VYVYVYVYVYVYVYVYVYVYVYVYVYVY 327
Ea_Trip2 324 VYVYVYVYVYVYVYVYVYVYVYVYVYVY 327
Sp_Trip1 334 WNDLFEELRLEDTFFRBYVFSFLNYVS 337
Sc_East2p 334 WNDLFEELRLEDTFFRBYVFSFLNYVS 337
Ea_Trip2 334 WNDLFEELRLEDTFFRBYVFSFLNYVS 337
Sp_Trip1 346 HKRISLSEVLGRSKNAKVELSKYKRIFA 349
Sc_East2p 346 HKRISLSEVLGRSKNAKVELSKYKRIFA 349
Ea_Trip2 346 HKRISLSEVLGRSKNAKVELSKYKRIFA 349
Sp_Trip1 358 LRLKDFRFRYS-----DIWTKHNLMLAI 415
Sc_East2p 358 LRLKDFRFRYS-----DIWTKHNLMLAI 415
Ea_Trip2 358 LRLKDFRFRYS-----DIWTKHNLMLAI 415
Sp_Trip1 415 LNTNLSLMQVETS-AKHYYFNRH-----IYVLW 418
Sc_East2p 415 LNTNLSLMQVETS-AKHYYFNRH-----IYVLW 418
Ea_Trip2 415 LNTNLSLMQVETS-AKHYYFNRH-----IYVLW 418
Sp_Trip1 424 LKLRNLSYNSPYS-----LHNNR 427
Sc_East2p 424 LKLRNLSYNSPYS-----LHNNR 427
Ea_Trip2 424 LKLRNLSYNSPYS-----LHNNR 427
Sp_Trip1 434 KLRNLRLDVLVSLRCLK-----GOKSTSKY 437
Sc_East2p 434 KLRNLRLDVLVSLRCLK-----GOKSTSKY 437
Ea_Trip2 434 KLRNLRLDVLVSLRCLK-----GOKSTSKY 437
Sp_Trip1 446 LKLRNLSYNSPYS-----LHNNR 449
Sc_East2p 446 LKLRNLSYNSPYS-----LHNNR 449
Ea_Trip2 446 LKLRNLSYNSPYS-----LHNNR 449
Sp_Trip1 458 LKLRNLSYNSPYS-----LHNNR 461
Sc_East2p 458 LKLRNLSYNSPYS-----LHNNR 461
Ea_Trip2 458 LKLRNLSYNSPYS-----LHNNR 461
Sp_Trip1 468 TOKTYSPLAYI-----LNTNLRFLL 471
Sc_East2p 468 TOKTYSPLAYI-----LNTNLRFLL 471
Ea_Trip2 468 TOKTYSPLAYI-----LNTNLRFLL 471
Sp_Trip1 478 KSLCLAKG-----LNTNLRFLL 481
Sc_East2p 478 KSLCLAKG-----LNTNLRFLL 481
Ea_Trip2 478 KSLCLAKG-----LNTNLRFLL 481
Sp_Trip1 488 LKLRNLSYNSPYS-----LHNNR 491
Sc_East2p 488 LKLRNLSYNSPYS-----LHNNR 491
Ea_Trip2 488 LKLRNLSYNSPYS-----LHNNR 491
Sp_Trip1 498 LKLRNLSYNSPYS-----LHNNR 501
Sc_East2p 498 LKLRNLSYNSPYS-----LHNNR 501
Ea_Trip2 498 LKLRNLSYNSPYS-----LHNNR 501
Sp_Trip1 508 LKLRNLSYNSPYS-----LHNNR 511
Sc_East2p 508 LKLRNLSYNSPYS-----LHNNR 511
Ea_Trip2 508 LKLRNLSYNSPYS-----LHNNR 511
Sp_Trip1 518 LKLRNLSYNSPYS-----LHNNR 521
Sc_East2p 518 LKLRNLSYNSPYS-----LHNNR 521
Ea_Trip2 518 LKLRNLSYNSPYS-----LHNNR 521
Sp_Trip1 528 LKLRNLSYNSPYS-----LHNNR 531
Sc_East2p 528 LKLRNLSYNSPYS-----LHNNR 531
Ea_Trip2 528 LKLRNLSYNSPYS-----LHNNR 531
Sp_Trip1 538 LKLRNLSYNSPYS-----LHNNR 541
Sc_East2p 538 LKLRNLSYNSPYS-----LHNNR 541
Ea_Trip2 538 LKLRNLSYNSPYS-----LHNNR 541
Sp_Trip1 548 LKLRNLSYNSPYS-----LHNNR 551
Sc_East2p 548 LKLRNLSYNSPYS-----LHNNR 551
Ea_Trip2 548 LKLRNLSYNSPYS-----LHNNR 551
Sp_Trip1 558 LKLRNLSYNSPYS-----LHNNR 561
Sc_East2p 558 LKLRNLSYNSPYS-----LHNNR 561
Ea_Trip2 558 LKLRNLSYNSPYS-----LHNNR 561
Sp_Trip1 568 LKLRNLSYNSPYS-----LHNNR 571
Sc_East2p 568 LKLRNLSYNSPYS-----LHNNR 571
Ea_Trip2 568 LKLRNLSYNSPYS-----LHNNR 571
Sp_Trip1 578 LKLRNLSYNSPYS-----LHNNR 581
Sc_East2p 578 LKLRNLSYNSPYS-----LHNNR 581
Ea_Trip2 578 LKLRNLSYNSPYS-----LHNNR 581
Sp_Trip1 588 LKLRNLSYNSPYS-----LHNNR 591
Sc_East2p 588 LKLRNLSYNSPYS-----LHNNR 591
Ea_Trip2 588 LKLRNLSYNSPYS-----LHNNR 591
Sp_Trip1 598 LKLRNLSYNSPYS-----LHNNR 601
Sc_East2p 598 LKLRNLSYNSPYS-----LHNNR 601
Ea_Trip2 598 LKLRNLSYNSPYS-----LHNNR 601
Sp_Trip1 608 LKLRNLSYNSPYS-----LHNNR 611
Sc_East2p 608 LKLRNLSYNSPYS-----LHNNR 611
Ea_Trip2 608 LKLRNLSYNSPYS-----LHNNR 611
Sp_Trip1 618 LKLRNLSYNSPYS-----LHNNR 621
Sc_East2p 618 LKLRNLSYNSPYS-----LHNNR 621
Ea_Trip2 618 LKLRNLSYNSPYS-----LHNNR 621
Sp_Trip1 628 LKLRNLSYNSPYS-----LHNNR 631
Sc_East2p 628 LKLRNLSYNSPYS-----LHNNR 631
Ea_Trip2 628 LKLRNLSYNSPYS-----LHNNR 631
Sp_Trip1 638 LKLRNLSYNSPYS-----LHNNR 641
Sc_East2p 638 LKLRNLSYNSPYS-----LHNNR 641
Ea_Trip2 638 LKLRNLSYNSPYS-----LHNNR 641
Sp_Trip1 648 LKLRNLSYNSPYS-----LHNNR 651
Sc_East2p 648 LKLRNLSYNSPYS-----LHNNR 651
Ea_Trip2 648 LKLRNLSYNSPYS-----LHNNR 651
Sp_Trip1 658 LKLRNLSYNSPYS-----LHNNR 661
Sc_East2p 658 LKLRNLSYNSPYS-----LHNNR 661
Ea_Trip2 658 LKLRNLSYNSPYS-----LHNNR 661
Sp_Trip1 668 LKLRNLSYNSPYS-----LHNNR 671
Sc_East2p 668 LKLRNLSYNSPYS-----LHNNR 671
Ea_Trip2 668 LKLRNLSYNSPYS-----LHNNR 671
Sp_Trip1 678 LKLRNLSYNSPYS-----LHNNR 681
Sc_East2p 678 LKLRNLSYNSPYS-----LHNNR 681
Ea_Trip2 678 LKLRNLSYNSPYS-----LHNNR 681
Sp_Trip1 688 LKLRNLSYNSPYS-----LHNNR 691
Sc_East2p 688 LKLRNLSYNSPYS-----LHNNR 691
Ea_Trip2 688 LKLRNLSYNSPYS-----LHNNR 691
Sp_Trip1 698 LKLRNLSYNSPYS-----LHNNR 701
Sc_East2p 698 LKLRNLSYNSPYS-----LHNNR 701
Ea_Trip2 698 LKLRNLSYNSPYS-----LHNNR 701
Sp_Trip1 708 LKLRNLSYNSPYS-----LHNNR 711
Sc_East2p 708 LKLRNLSYNSPYS-----LHNNR 711
Ea_Trip2 708 LKLRNLSYNSPYS-----LHNNR 711
Sp_Trip1 718 LKLRNLSYNSPYS-----LHNNR 721
Sc_East2p 718 LKLRNLSYNSPYS-----LHNN

6

[illegible]

FIGURE 43

Disruption strategy for the putative telomerase genes.

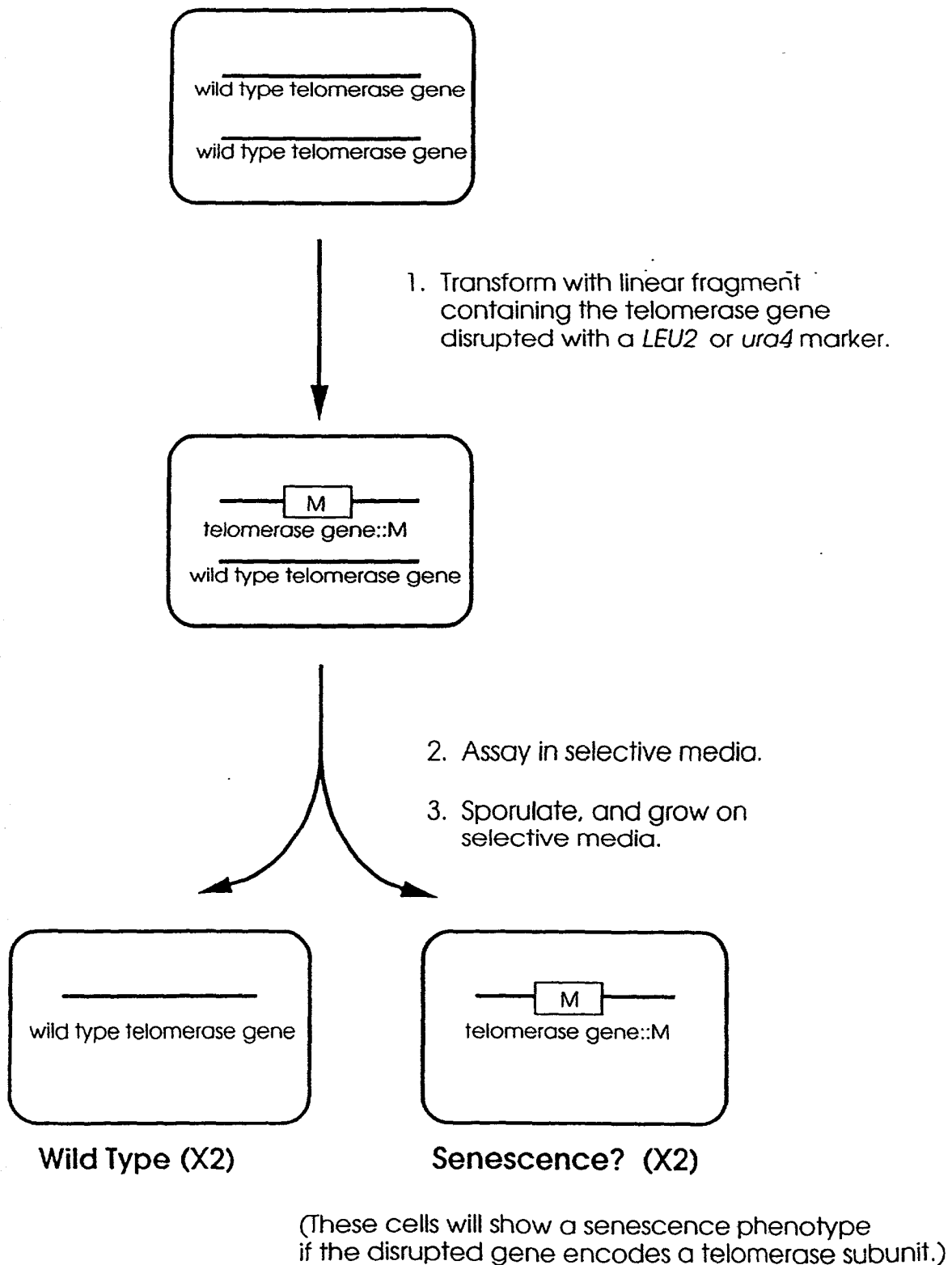


FIGURE 44

An Example of Confirmation of *tez1* disruption By PCR

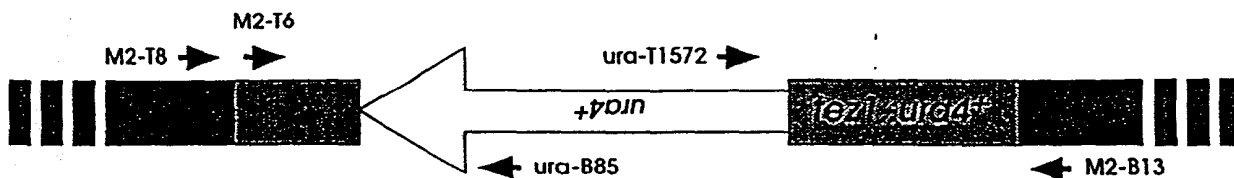
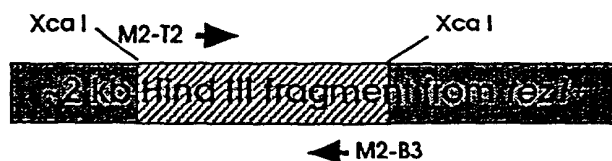
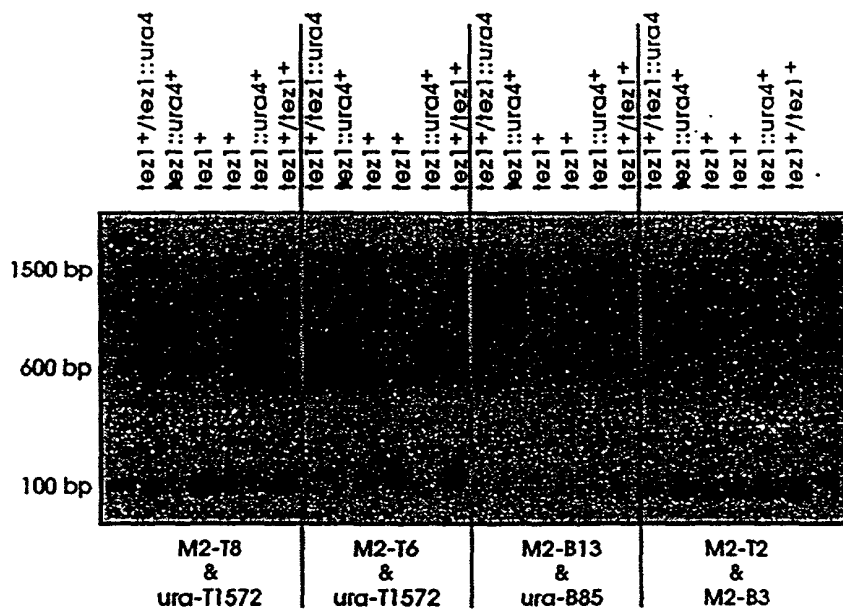


FIGURE 45

Tez1 disruption causes progressive shortening of telomeres in *S. pombe*

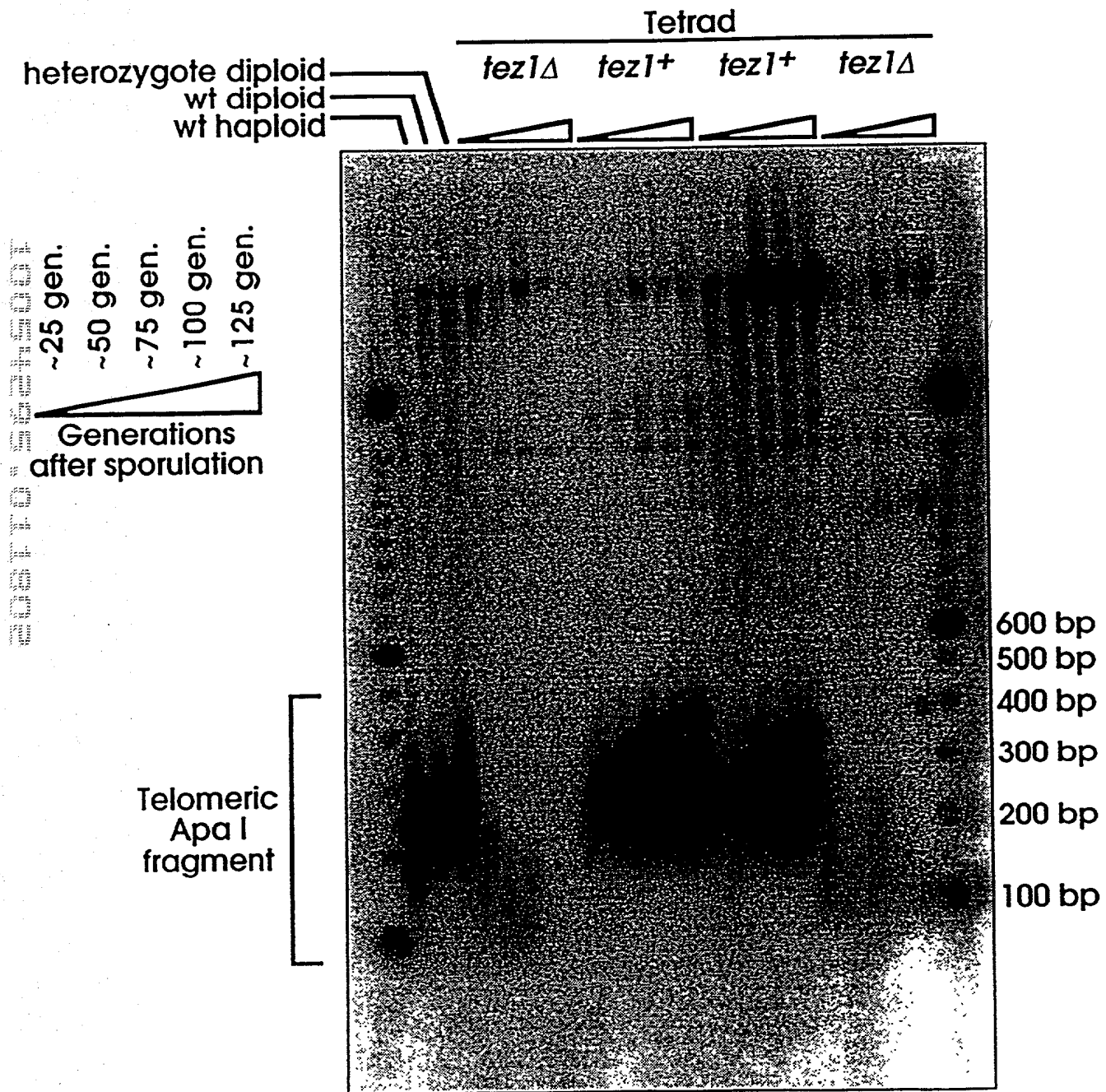


FIGURE 46

1 ggtaccgatttacttttctttcttcataagctaattgcttcctcgaacgctcctaaatctctggaaatatttttacaaga 80
 81 actcaataacaataccaagtcaaattccaatatgaagggtgttatttagtgatcgataatatttctattttatcggtcggtta 160
 161 ccaagtataaggacaaaaagaacaacttccttccccctaaagacttttactttattaatttacttttcaaataatatttcg 240
 241 gggtcgcttacttttaatcgtggtaactgttttagctgctacttctagccaacgcggtgtttctaccccgctcattggatat 320
 321 agctcttggagtagctcacagaaatccttacaaatcttctgatgagactatattagattcattacagtcggtgcatattc 400
 401 ttaacatggagccttacacttttagatgagtcacgtcgcatgatggagtatttgggtatcatccaacgtttgccttgaaaag 480
 481 gttgataattatttgcaaaatcatgtccttagtggtggtaatccgcgaaagttttttgatgcttgacacgctctagcatg 560
 561 attgagatattcaaaaatttctatccactacaactcctttaacgcgggttttatttttctattttctattctcatgttggt 640
 641 ccaaatatgtatcatctcgtatttaggctttttccggttttactcctggaatcgtaaccttttctactattccccctaatga 720
 721 ataatctaaattagtttcgcttataattgatagtagtagaaagattgggtgattctactcgtgtaatgttattagtttaaa 800
 801 gatactttgcaaaacatttattagctatcattatataaaaaaaatcctataattataaatattaatcaatatttgcggtc 880
 881 actattttatttaaaacggttatgatcagtaggacactttgcatatatatagtttatgcttaatgggttacttgtaacttgc 958

 959 ATG ACC GAA CAC CAT ACC CCC AAA AGC AGG ATT CTT CGC TTT CTA GAG AAT CAA TAT GTA 1018
 1 M T E H H T P K S R I L R F L E N Q Y V 20
 1019 TAC CTA TGT ACC TTA AAT GAT TAT GTA CAA CTT GTT TTG AGA GGG TCG CCG GCA AGC TCG 1078
 21 Y L C T L N D Y V Q L V L R G S P A S S 40
 1079 TAT AGC AAT ATA TGC GAA CGC TTG AGA AGC GAT GTA CAA ACG TCC TTT TCT ATT TTT CTT 1138
 41 Y S N I C E R L R S D V Q T S F S I F L 60
 1139 CAT TCG ACT GTA GTC GGC TTC GAC AGT AAG CCA GAT GAA GGT GTT CAA TTT TCT TCT CCA 1198
 61 H S T V V G F D S K P D E G V Q F S S P 80

FIGURE 46 (cont.)

| | | | |
|------|---|--|------|
| 1199 | AAA TGC TCA CAG TCA GAG | gtatatatatatgttttgatttttttctattcgggatagctaatatatgggcag | 1272 |
| 81 | K C S Q S E | | 86 |
| 1273 | CTA ATA GCG AAT GTT GTA AAA CAG ATG TTC GAT GAA AGT TTT GAG CGT CGA AGG AAT CTA | 1332 | |
| 87 | L I A N V V K Q M F D E S F E R R R N L | 106 | |
| 1333 | CTG ATG AAA GGG TTT TCC ATG | gtaagggtatttctaattgtgaaatattttacctgcaattactgtttcaaagaga | 1405 |
| 107 | L M K G F S M | 113 | |
| 1406 | ttgtattttaaccgataaag | AAT CAT GAA GAT TTT CGA GCC ATG CAT GTA AAC GGA GTA CAA AAT | 1469 |
| 114 | | N H E D F R A M H V N G V Q N | 128 |
| 1470 | GAT CTC GTT TCT ACT TTT CCT AAT TAC CTT ATA TCT ATA CTT GAG TCA AAA AAT TGG CAA | 1529 | |
| 129 | D L V S T F P N Y L I S I L E S K N W Q | 148 | |
| 1530 | CTT TTG TTA GAA AT | gtaaataccggttaagatgttgcgcaactttgaacaagactgacaagtatag T ATC GGC | 1601 |
| 149 | L L L E I | I G | 155 |
| 1602 | AGT GAT GCC ATG CAT TAC TTA TTA TCC AAA GGA AGT ATT TTT GAG GCT CTT CCA AAT GAC | 1661 | |
| 156 | S D A M H Y L L S K G S I F E A L P N D | 175 | |
| 1662 | AAT TAC CTT CAG ATT TCT GGC ATA CCA CTT TTT AAA AAT AAT GTG TTT GAG GAA ACT GTG | 1721 | |
| 176 | N Y L Q I S G I P L F K N N V F E E T V | 195 | |
| 1722 | TCA AAA AAA AGA AAG CGA ACC ATT GAA ACA TCC ATT ACT CAA AAT AAA AGC GCC CGC AAA | 1781 | |
| 196 | S K K R K R T I E T S I T Q N K S A R K | 215 | |
| 1782 | GAA GTT TCC TGG AAT AGC ATT TCA ATT AGT AGG TTT AGC ATT TTT TAC AGG TCA TCC TAT | 1841 | |
| 216 | E V S W N S I S I S R F S I F Y R S S Y | 235 | |
| 1842 | AAG AAG TTT AAG CAA G | gtaactaataactgttatccttcataactaatttttag AT CTA TAT TTT AAC | |
| 1907 | | | |
| 236 | K K F K Q D | L Y F N | 245 |
| 1908 | TTA CAC TCT ATT TGT GAT CGG AAC ACA GTA CAC ATG TGG CTT CAA TGG ATT TTT CCA AGG | 1967 | |
| 246 | L H S I C D R N T V H M W L Q W I F P R | 265 | |
| 1968 | CAA TTT GGA CTT ATA AAC GCA TTT CAA GTG AAG CAA TTG CAC AAA GTG ATT CCA CTG GTA | 2027 | |
| 266 | Q F G L I N A F Q V K Q L H K V I P L V | 285 | |
| 2028 | TCA CAG AGT ACA GTT GTG CCC AAA CGT CTC CTA AAG GTA TAC CCT TTA ATT GAA CAA ACA | 2087 | |
| 286 | S Q S T V V P K R L L K V Y P L I E Q T | 305 | |
| 2088 | GCA AAG CGA CTC CAT CGT ATT TCT CTA TCA AAA GTT TAC AAC CAT TAT TGC CCA TAT ATT | 2147 | |
| 306 | A K R L H R I S L S K V Y N H Y C P Y I | 325 | |
| 2148 | GAC ACC CAC GAT GAT GAA AAA ATC CTT AGT TAT TCC TTA AAG CCG AAC CAG GTG TTT GCG | 2207 | |
| 326 | D T H D D E K I L S Y S L K P N Q V F A | 345 | |
| 2208 | TTT CTT CGA TCC ATT CTT GTT CGA GTG TTT CCT AAA TTA ATC TGG GGT AAC CAA AGG ATA | 2267 | |
| 346 | F L R S I L V R V F P K L I W G N Q R I | 365 | |
| 2268 | TTT GAG ATA ATA TTA AAA G | gtattgtataaaaattttattaccactaacgattttaccag AC CTC GAA ACT | 2336 |
| 366 | F E I I L K D | L E T | 375 |

FIGURE 46 (cont.)

| | | | |
|------|---|---|------|
| 2337 | TTC TTG AAA TTA TCG AGA TAC GAG TCT TTT AGT TTA CAT TAT TTA ATG AGT AAC ATA AAG | 2396 | |
| 376 | F L K L S R Y E S F S L H Y L M S N I K | 395 | |
| 2397 | gtaatatgccaaatttttttaccattaattaacaatcag | ATT TCA GAA ATT GAA TGG CTA GTC CTT GGA | 2465 |
| 396 | | I S E I E W L V L G | 405 |
| 2466 | AAA AGG TCA AAT GCG AAA ATG TGC TTA AGT GAT TTT GAG AAA CGC AAG CAA ATA TTT GCG | 2525 | |
| 406 | K R S N A K M C L S D F E K R K Q I F A | 425 | |
| 2526 | GAA TTC ATC TAC TGG CTA TAC AAT TCG TTT ATA ATA CCT ATT TTA CAA TCT TTT TTT TAT | 2585 | |
| 426 | E F I Y W L Y N S F I I P I L Q S F F Y | 445 | |
| 2586 | ATC ACT GAA TCA AGT GAT TTA CGA AAT CGA ACT GTT TAT TTT AGA AAA GAT ATT TGG AAA | 2645 | |
| 446 | I T E S S D L R N R T V Y F R K D I W K | 465 | |
| 2646 | CTC TTG TGC CGA CCC TTT ATT ACA TCA ATG AAA ATG GAA GCG TTT GAA AAA-ATA AAC GAG | 2705 | |
| 466 | L L C R P F I T S M K M E A F E K I N E | 485 | |
| 2706 | gtatttttaaagtattttttgcaaaaagctaataatttttcag | AAC AAT GTT AGG ATG GAT ACT CAG AAA ACT | 2775 |
| 486 | | N N V R M D T Q K T | 495 |
| 2776 | ACT TTG CCT CCA GCA GTT ATT CGT CTA TTA CCT AAG AAG AAT ACC TTT CGT CTC ATT ACG | 2835 | |
| 496 | T L P P A V I R L L P K K N T F R L I T | 515 | |
| 2836 | AAT TTA AGA AAA AGA TTC TTA ATA AAG gtattaatttttggtcatcaatgtactttacttctaattctatta | 2906 | |
| 516 | N L R K R F L I K | 524 | |
| 2907 | ttagcag ATG GGT TCA AAC AAA AAA ATG TTA GTC AGT ACG AAC CAA ACT TTA CGA CCT GTG | 2967 | |
| 525 | M G S N K K M L V S T N Q T L R P V | 542 | |
| 2968 | GCA TCG ATA CTG AAA CAT TTA ATC AAT GAA GAA AGT AGT GGT ATT CCA TTT AAC TTG GAG | 3027 | |
| 543 | A S I L K H L I N E E S S G I P F N L E | 562 | |
| 3028 | GTT TAC ATG AAG CTT CTT ACT TTT AAG AAG GAT CTT CTT AAG CAC CGA ATG TTT GG gtaat | 3088 | |
| 563 | V Y M K L L T F K K D L L K H R M F G | 581 | |
| 3089 | tatataatgcgcgattcctcattattaattttgcag | G CGT AAG AAG TAT TTT GTA CGG ATA GAT ATA | 3155 |
| 582 | | R K K Y F V R I D I | 591 |
| 3156 | AAA TCC TGT TAT GAT CGA ATA AAG CAA GAT TTG ATG TTT CGG ATT GTT AAA AAG AAA CTC | 3215 | |
| 592 | K S C Y D R I K Q D L M F R I V K K K L | 611 | |
| 3216 | AAG GAT CCC GAA TTT GTA ATT CGA AAG TAT GCA ACC ATA CAT GCA ACA AGT GAC CGA GCT | 3275 | |
| 612 | K D P E F V I R K Y A T I H A T S D R A | 631 | |
| 3276 | ACA AAA AAC TTT GTT AGT GAG GCG TTT TCC TAT T gtaagtttatttttttcattggaattttttaacaa | 3343 | |
| 632 | T K N F V S E A F S Y F | 643 | |
| 3344 | attcttttttag TT GAT ATG GTG CCT TTT GAA AAA GTC GTG CAG TTA CTT TCT ATG AAA ACA | 3405 | |
| 644 | | D M V P F E K V V Q L L S M K T | 659 |
| 3406 | TCA GAT ACT TTG TTT GTT GAT TTT GTG GAT TAT TGG ACC AAA AGT TCT TCT GAA ATT TTT | 3465 | |
| 660 | S D T L F V D F V D Y W T K S S S E I F | 679 | |
| 3466 | AAA ATG CTC AAG GAA CAT CTC TCT GGA CAC ATT GTT AAG gtataccaattggtgaattgtaataaca | 3532 | |
| 680 | K M L K E H L S G H I V K | 692 | |

100

| | | | | | | | | | | | | | | | | | | | | | |
|------|------------------|-------------------|--------|-----|-----|-----|-----|-----|-----|---|-----|-----|-----|-----|-----|-------------------------|--------------------|-----|-----------|------|------|
| 3533 | cta | gaa | act | g | ATA | GGA | AAT | TCT | CAA | TAC | CTT | CAA | AAA | GTT | GGT | ATC | CCT | CAG | GGC | TCA | 3593 |
| 693 | | | | | I | G | N | S | Q | Y | L | Q | K | V | G | I | P | Q | G | S | 708 |
| 3594 | ATT | CTG | TCA | TCT | TTT | TTG | TGT | CAT | TTC | TAT | ATG | GAA | GAT | TTG | ATT | GAT | GAA | TAC | CTA | TCG | 3653 |
| 709 | I | L | S | S | F | L | C | H | F | Y | M | E | D | L | I | D | E | Y | L | S | 728 |
| 3654 | TTT | ACG | AAA | AAG | AAA | GGA | TCA | GTG | TTG | TTA | CGA | GTA | GTC | GAC | GAT | TTC | CTC | TTT | ATA | ACA | 3713 |
| 729 | F | T | K | K | K | G | S | V | L | L | R | V | V | D | D | F | L | F | I | T | 748 |
| 3714 | GTT | AAT | AAA | AAG | GAT | GCA | AAA | AAA | TTT | TTG | AAT | TTA | TCT | TTA | AGA | G | gtgagttgctgtcattcc | | | | 3777 |
| 749 | V | N | K | K | D | A | K | K | F | L | N | L | S | L | R | G | | | | | 764 |
| 3778 | taagttcta | accg | ttgaag | GA | TTT | GAG | AAA | CAC | AAT | TTT | TCT | ACG | AGC | CTG | GAG | AAA | ACA | GTA | | | 3840 |
| 765 | | | | | F | E | K | H | N | F | S | T | S | L | E | K | T | V | | | 778 |
| 3841 | ATA | AAC | TTT | GAA | AAT | AGT | AAT | GGG | ATA | ATA | AAC | AAT | ACT | TTT | TTT | AAT | GAA | AGC | AAG | AAA | 3900 |
| 779 | I | N | F | E | N | S | N | G | I | I | N | N | T | F | F | N | E | S | K | K | 798 |
| 3901 | AGA | ATG | CCA | TTC | TTC | GGT | TTC | TCT | GTG | AAC | ATG | AGG | TCT | CTT | GAT | ACA | TTG | TTA | GCA | TGT | 3960 |
| 799 | R | M | P | F | F | G | F | S | V | N | M | R | S | L | D | T | L | L | A | C | 818 |
| 3961 | CCT | AAA | ATT | GAT | GAA | GCC | TTA | TTT | AAC | TCT | ACA | TCT | GTA | GAG | CTG | ACG | AAA | CAT | ATG | GGG | 4020 |
| 819 | P | K | I | D | E | A | L | F | N | S | T | S | V | E | L | T | K | H | M | G | 838 |
| 4021 | AAA | TCT | TTT | TTT | TAC | AAA | ATT | CTA | AG | gtatactgtgtaactgaataatagctgacaaataatcag | A | TCG | | | | | | | | 4089 | |
| 839 | K | S | F | F | Y | K | I | L | R | | | S | | | | | | | | 848 | |
| 4090 | AGC | CTT | GCA | TCC | TTT | GCA | CAA | GTA | TTT | ATT | GAC | ATT | ACC | CAC | AAT | TCA | AAA | TTC | AAT | TCT | 4149 |
| 849 | S | L | A | S | F | A | Q | V | F | I | D | I | T | H | N | S | K | F | N | S | 868 |
| 4150 | TGC | TGC | AAT | ATA | TAT | AGG | CTA | GGA | TAC | TCT | ATG | TGT | ATG | AGA | GCA | CAA | GCA | TAC | TTA | AAA | 4209 |
| 869 | C | C | N | I | Y | R | L | G | Y | S | M | C | M | R | A | Q | A | Y | L | K | 888 |
| 4210 | AGG | ATG | AAG | GAT | ATA | TTT | ATT | CCC | CAA | AGA | ATG | TTC | ATA | ACG | G | gtgagtacttatttttaactaga | | | | 4274 | |
| 889 | R | M | K | D | I | F | I | P | Q | R | M | F | I | T | D | | | | | 903 | |
| 4275 | aaagtcatta | attaac | cttag | AT | CTT | TTG | AAT | GTT | ATT | GGA | AGA | AAA | ATT | TGG | AAA | AAG | TTG | GCC | | | 4339 |
| 904 | | | | | L | L | N | V | I | G | R | K | I | W | K | K | L | A | | | 917 |
| 4340 | GAA | ATA | TTA | GGA | TAT | ACG | AGT | AGG | CGT | TTC | TTG | TCC | TCT | GCA | GAA | GTC | AAA | TG | gtacgtgtc | | 4401 |
| 918 | E | I | L | G | Y | T | S | R | R | F | L | S | S | A | E | V | K | W | | | 935 |
| 4402 | ggtctcgagacttcag | caatattgacacatcag | G | CTT | TTT | TGT | CTT | GGA | ATG | AGA | GAT | GGT | TTG | AAA | | | | | | | 4468 |
| 936 | | | | | L | F | C | L | G | M | R | D | G | L | K | | | | | | 946 |
| 4469 | CCC | TCT | TTC | AAA | TAT | CAT | CCA | | | | | | | | | | | | | | |

FIGURE 46 (cont.)

4666 gctgacccccaaagcaagcatactataggatttctagtaaagtaaaattaatctcgttattagttttgattgacttgct 4745
4746 ttatccttatacttttaagaaagattgacagtggttgctgactactgccacatgccattaaacgggagtggttaaaca 4825
4826 ttaaaagtaatacatgaggctaatactcctttcatttagaataaggaaagtggttttctataatgaataatgccgcacta 4905
4906 atgcaaaaagacgaagattatcttctaacaagggggattaagcatatccgaaggaaaagagagtaataataccagtggt 4985
4986 gttgaagaaagcaaggataatttgaacaagcttctgcagatgacaggctaattttggtgaccgaattttggtaaaagc 5065
5066 cccaggttatccatggtggccggccttgctactgagacgaaaagaaactaaggatagtttgaataactaatagctcattta 5145
5146 atgtcttatataagggttttgttttttcttgacttcaattttgcatgggtgaaaagaaatagtggttaagccattattggat 5225
5226 tccgaaatagccaaatttcttggttcctcaaagcggaagtctaagaacttattgaagcttatgaggcttcaaaaaactcc 5305
5306 tcctgatttaaaggaggaatcttccaccgatgaggaaatggatagcttatcagctgctgaggagaagcctaattttttgc 5385
5386 aaaaaagaaaatatcattgggagacatctcttgatgaatcagatgaggagagtatctccagcggatccttgatgtcaata 5465
5466 acttctattttctgaaatgtatggtcctactgtcgcttcgacttctcgtagctctacgcagttaagtgaccaaaggtagc 5544

4666
4746
4826
4906
4986
5066
5146
5226
5306
5386
5466

FIGURE 47

1
 met ser val tyr val val glu leu leu
 ATG AGT GTG TAC GTC GTC GAG CTG CTC
 GCCAAGTTCCTGCACTGGCTG
 10 20
 arg ser phe phe tyr val thr glu thr thr phe gln lys asn arg
 AGG TCT TTC TTT TAT GTC ACG GAG ACC ACG TTT CAA AAG AAC AGG
 30
 leu phe phe tyr arg lys ser val trp ser lys leu gln ser ile
 CTC TTT TTC TAC CGG AAG AGT GTC TGG AGC AAG TTG CAA AGC ATT
 40 50
 gly ile arg gln his leu lys arg val gln leu arg glu leu ser
 GGA ATC AGA CAG CAC TTG AAG AGG GTG CAG CTG CGG GAG CTG TCG
 60
 glu ala glu val arg gln his arg glu ala arg pro ala leu leu
 GAA GCA GAG GTC AGG CAG CAT CGG GAA GCC AGG CCC GCC CTG CTG
 70 80
 thr ser arg leu arg phe ile pro lys pro asp gly leu arg pro
 ACG TCC AGA CTC CGC TTC ATC CCC AAG CCT GAC GGG CTG CGG CCG
 90
 ile val asn met asp tyr val val gly ala arg thr phe arg arg
 ATT GTG AAC ATG GAC TAC GTC GTG GGA GCC AGA ACG TTC CGC AGA
 100 110
 glu lys ala glu arg leu thr ser arg val lys ala leu phe
 GAA AAG ARG GCC GAG CGT CTC ACC TCG AGG GTG AAG GCA CTG TTC
 120
 ser val leu asn tyr glu arg ala arg arg pro gly leu leu gly
 AGC GTG CTC AAC TAC GAG CGG GCG CGG CGC CCC GGC CTC CTG GGC
 130 140
 ala ser val leu gly leu asp asp ile his arg ala trp arg thr
 GCC TCT GTG CTG GGC CTG GAC GAT ATC CAC AGG GCC TGG CGC ACC
 150
 phe val leu arg val arg ala gln asp pro pro pro glu leu tyr
 TTC GTG CTG CGT GTG CGG GCC CAG GAC CCG CCG CCT GAG CTG TAC
 160 170
 phe val lys val asp val thr gly ala tyr asp thr ile pro gln
 TTT GTC AAG GTG GAT GTG ACG GGC GCG TAC GAC ACC ATC CCC CAG
 180
 asp arg leu thr glu val ile ala ser ile ile lys pro gln asn
 GAC AGG CTC ACG GAG GTC ATC GCC AGC ATC ATC AAA CCC CAG AAC

FIGURE 47 (cont.)

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 190 | thr | tyr | cys | val | arg | arg | tyr | ala | val | val | 200 | gln | lys | ala | ala | met | | | | | | | | | | |
| | ACG | TAC | TGC | GTG | CGT | CGG | TAT | GCC | GTG | GTC | | CAG | AAG | GCC | GCC | ATG | | | | | | | | | | |
| | | | | | | | | | | | 210 | gly | thr | ser | ala | arg | pro | ser | arg | ala | thr | ser | tyr | val | gln | cys |
| | | | | | | | | | | | | GGC | ACG | TCC | GCA | AGG | CCT | TCA | AGA | GCC | ACG | TCC | TAC | GTC | CAG | TGC |
| 220 | gln | gly | ile | pro | gln | gly | ser | ile | leu | ser | 230 | thr | leu | leu | cys | ser | | | | | | | | | | |
| | CAG | GGG | ATC | CCG | CAG | GGC | TCC | ATC | CTC | TCC | | ACG | CTG | CTC | TGC | AGC | | | | | | | | | | |
| | | | | | | | | | | | 240 | leu | cys | tyr | gly | asp | met | glu | asn | lys | leu | phe | ala | gly | ile | arg |
| | | | | | | | | | | | | CTG | TGC | TAC | GGC | GAC | ATG | GAG | AAC | AAG | CTG | TTT | GCG | GGG | ATT | CGG |
| 250 | arg | asp | gly | leu | leu | leu | arg | leu | val | asp | 260 | asp | phe | leu | leu | val | | | | | | | | | | |
| | CGG | GAC | GGG | CTG | CTC | CTG | CGT | TTG | GTG | GAT | | GAT | TTC | TTG | TTG | GTG | | | | | | | | | | |
| | | | | | | | | | | | 270 | thr | pro | his | leu | thr | his | ala | lys | thr | phe | leu | arg | thr | leu | val |
| | | | | | | | | | | | | ACA | CCT | CAC | CTC | ACC | CAC | GCG | AAA | ACC | TTC | CTC | AGG | ACC | CTG | GTC |
| 280 | arg | gly | val | pro | glu | tyr | gly | cys | val | val | 290 | asn | leu | arg | lys | thr | | | | | | | | | | |
| | CGA | GGT | GTC | CCT | GAG | TAT | GGC | TGC | GTG | GTG | | AAC | TTG | CGG | AAG | ACA | | | | | | | | | | |
| | | | | | | | | | | | 300 | val | val | asn | phe | pro | val | glu | asp | glu | ala | leu | gly | gly | thr | ala |
| | | | | | | | | | | | | GTG | GTG | AAC | TTC | CCT | GTA | GAA | GAC | GAG | GCC | CTG | GGT | GGC | ACG | GCT |
| 310 | phe | val | gln | met | pro | ala | his | gly | leu | phe | 320 | pro | trp | cys | gly | leu | | | | | | | | | | |
| | TTT | GTT | CAG | ATG | CCG | GCC | CAC | GGC | CTA | TTC | | CCC | TGG | TGC | GGC | CTG | | | | | | | | | | |
| | | | | | | | | | | | 330 | leu | leu | asp | thr | arg | thr | leu | glu | val | gln | ser | asp | tyr | ser | ser |
| | | | | | | | | | | | | CTG | CTG | GAT | ACC | CGG | ACC | CTG | GAG | GTG | CAG | AGC | GAC | TAC | TCC | AGC |
| 340 | tyr | ala | arg | thr | ser | ile | arg | ala | ser | leu | 350 | thr | phe | asn | arg | gly | | | | | | | | | | |
| | TAT | GCC | CGG | ACC | TCC | ATC | AGA | GCC | AGT | CTC | | ACC | TTC | AAC | CGC | GGC | | | | | | | | | | |
| | | | | | | | | | | | 360 | phe | lys | ala | gly | arg | asn | met | arg | arg | lys | leu | phe | gly | val | leu |
| | | | | | | | | | | | | TTC | AAG | GCT | GGG | AGG | AAC | ATG | CGT | CGC | AAA | CTC | TTT | GGG | GTC | TTG |
| 370 | arg | leu | lys | cys | his | ser | leu | phe | leu | asp | 380 | leu | gln | val | asn | ser | | | | | | | | | | |
| | CGG | CTG | AAG | TGT | CAC | AGC | CTG | TTT | CTG | GAT | | TTG | CAG | GTG | AAC | AGC | | | | | | | | | | |

FIGURE 47 (cont.)

390

leu gln thr val cys thr asn ile tyr lys ile leu leu leu gln
CTC CAG ACG GTG TGC ACC AAC ATC TAC AAG ATC CTC CTG CTG CAG

400

ala tyr arg phe his ala cys val leu gln leu pro phe his gln
GCG TAC AGG TTT CAC GCA TGT GTG CTG CAG CTC CCA TTT CAT CAG

410

420

gln val trp lys asn pro his phe ser cys ala ser ser leu thr
CAA GTT TGG AAG AAC CCA CAT TTT TCC TGC GCG TCA TCT CTG ACA

430

arg leu pro leu leu leu his pro glu ser gln glu arg arg asp
CGG CTC CCT CTG CTA CTC CAT CCT GAA AGC CAA GAA CGC AGG GAT

440

450

val ala gly gly gln gly arg arg arg pro ser ala leu arg gly
GTC GCT GGG GGC CAA GGG CGC CGC CGG CCC TCT GCC CTC CGA GGC

460

arg ala val ala val pro pro ser ile pro ala gln ala asp ser
CGT GCA GTG GCT GTG CCA CCA AGC ATT CCT GCT CAA GCT GAC TCG

470

480

thr pro cys his leu arg ala thr pro gly val thr gln asp ser
ACA CCG TGT CAC CTA CGT GCC ACT CCT GGG GTC ACT CAG GAC AGC

490

pro asp ala ala glu ser glu ala pro gly asp asp ala asp cys
CCA GAC GCA GCT GAG TCG GAA GCT CCC GGG GAC GAC GCT GAC TGC

500

510

pro gly gly arg ser gln pro gly thr ala leu arg leu gln asp
CCT GGA GGC CGC AGC CAA CCC GGC ACT GCC CTC AGA CTT CAA GAC

520

his pro gly leu met ala thr arg pro gln pro gly arg glu gln
CAT CCT GGA CTG ATG GCC ACC CGC CCA CAG CCA GGC CGA GAG CAG

530

540

thr pro ala ala leu ser arg arg ala tyr thr ser gln gly gly
ACA CCA GCA GCC CTG TCA CGC CGG GCT TAT ACG TCC CAG GGA GGG

550

arg gly gly pro his pro gly leu his arg trp glu ser glu ala
AGG GGC GGC CCA CAC CCA GGC CTG CAC CGC TGG GAG TCT GAG GCC

560

564

OP

TGA GTGAGTGTGTTGGCCGAGGCCTGCATGTCCGGCTGAAGGCTGAGTGTCGGGCTGAGGC

CTGAGCGAGTGTCCAGCCAAGGGCTGAGTGTCCAGCACACCTGCGTTTTCACTTCCCCAC

FIGURE 47 (cont.)

AGGCTGGCGTTCGGTCCACCCCAGGGCCAGCTTTTCCTCACCAGGAGCCCGGCTTCCACT
CCCCACATAGGAATAGTCCATCCCCAGATTGCGCATTGTTTACCCTTCGCCCTGCCTTCC
TTTGCCTTCCACCCCCACCATTTCAGGTGGAGACCCTGAGAAGGACCCTGGGAGCTTTGGG
AATTTGGAGTGACCAAAGGTGTGCCCTGTACACAGGCGAGGACCCTGCACCTGGATGGGG
GTCCCTGTGGGTCAAATTGGGGGGAGGTGCTGTGGGAGTAAAATACTGAATATATGAGTT
TTTCAGTTTTTGAAAAAAAAAAAAAAAAAAAAAAAAAAAAA

FIGURE 48

Motif -1
 Ep p123 ...LVVSLIRCFYVTEQQKSYSKT...
 Sp Tez1 ...FIIPILQSFFYITESSDLRNRT...
 Sc Est2 ...LIPKIIQTFFYCTEISSTVTIV...
 Hs TCP1 ...YVVELLRSFFYVTETTFQKNRL...
 consensus FFY TE

Motif 0
 Ep p123 ...KSLGFAPGKLRLLIPKKT--TFRPIMTFNKKIV...
 Sp Tez1 ...QKTTLPPAVIRLLPKKN--TFLITNLRKRFL...
 Sc Est2 ...TLSNFNHSKMRIIPKKSNNEFRIIAIPCRGAD...
 Hs TCP1 ...ARPALLTSRLRFIPKPD--GLRPIVNMDYVVG...
 consensus R PK R I

Motif A
 Ep p123 ...PKLFFATMDIEKCYDSVNREKLSTFLK...
 Sp Tez1 ...RKKYFVRIDIKSCYDRIKQDLMFRIVK...
 Sc Est2 ...PELYFMKFDVKSCYDSIPRMECMRILK...
 Hs TCP1 ...PELYFVKVDVTGAYDTIPQDRLTEVIA...//...
 consensus F D YD

Motif B
 Ep p123 ...NGKFYKQTKGIPQGLCVSSILSSFYYA...
 Sp Tez1 ...GNSQYLOKVGIPQGSILSSFLCHFYME...
 Sc Est2 ...EDKCYIREDGLFQGSSLSAPIVDLVYD...
 Hs TCP1 ...RATSYVQCQGIPQGSILSTLLCSLCYG...
 consensus G QG S

Motif C
 Ep p123 ...PNVNLLMRLTDDYLLITTQENN...
 Sp Tez1 ...KKGSVLLRVVDDFLFITVNKKD...
 Sc Est2 ...SQDTLILKLADDFLIISTDQQQ...
 Hs TCP1 ...RRDGLLLRLVDDFLLVTPHLTH...
 consensus DD L

Motif D
 Ep p123 ...NVSRENGFKFNMKKL...
 Sp Tez1 ...LNLSLRGFEEKHNFST...
 Sc Est2 ...KKLAMGGFQKYNKA...
 Hs TCP1 ...LRTLVRGVPEYGCVV...
 consensus G

FIGURE 49

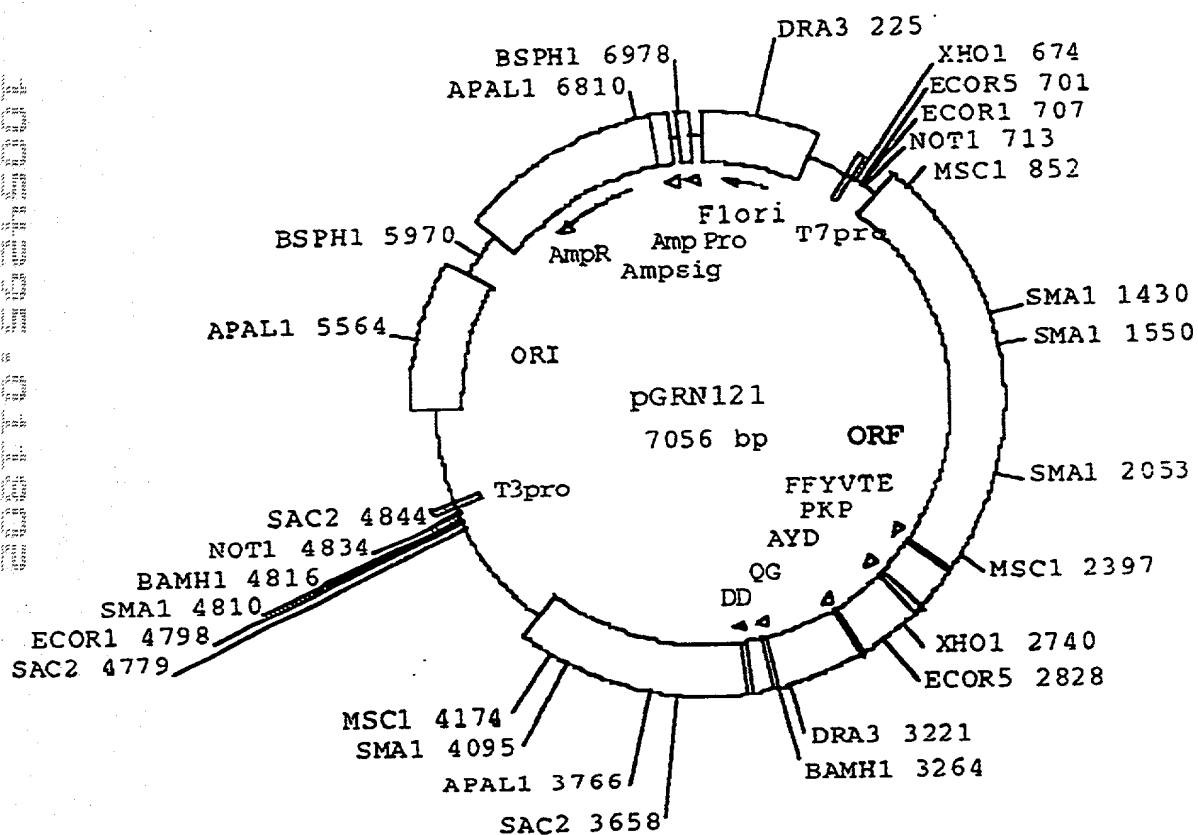


FIGURE 50

1 GCAGCGCTGC GTCCTGCTGC GCACGTGGGA AGCCCTGGCC CCGGCCACCC
 51 CCGCGATGCC GCGCGCTCCC CGCTGCCGAG CCGTGCGCTC CCTGCTGCGC
 101 AGCCACTACC GCGAGGTGCT GCCGCTGGCC ACGTTCGTGC GCGCCTGGG
 151 GCCCCAGGGC TGGCGGCTGG TGCAGCGCGG GGACCCGGCG GCTTTCGCG
 201 CGNTGGTGGC CCANTGCNTG GTGTGCGTGC CCTGGGAN GN ANGGCNGCCC
 251 CCCGCCGCCC CCTCCTTCCG CCAGGTGTCC TGCCTGAANG ANCTGGTGGC
 301 CCGAGTGCTG CANANGCTGT GCGANCGCGG CGCGAANAAC GTGCTGGCCT
 351 TCGGCTTCGC GCTGCTGGAC GGGGCCCGCG GGGGCCCCCG CGAGGCCTTC
 401 ACCACCAGCG TGCAGAGTA CCTGCCAAC ACGGTGACCG ACGCACTGCG
 451 GGGGAGCGGG GCGTGGGGGC TGCTGCTGCG CCGCGTGGGC GACGACGTGC
 501 TGGTTCACCT GCTGGCACGC TGCGCGTNT TTGTGCTGGT GGNTCCACG
 551 TGCCTACC ANGTGTGCG GCCGCCGCTG TACCAGCTCG GCGCTGCNAC
 601 TCAGGCCCGG CCCCCGCCAC ACGCTANTGG ACCCGAANGC GTCTGGGATC
 651 CAACGGGCCT GGAACCATAG CGTCAGGGAG GCCGGGGTCC CCCTGGGCTG
 701 CCAGCCCCGG GTGCGAGGAG GCGCGGGGGC AGTGCCAGCC GAAGTCTGCC
 751 GTTGCCCAAG AGGCCCAGGC GTGGCGCTGC CCCTGAGCCG GAGCGGACGC
 801 CCGTTGGGCA GGGGTCTTG GCCCACCGG GCAGGACGCC TGGACCGAGT
 851 GACCGTGGT TCTGTGTGGT GTCACCTGCC AGACCCGCCG AAGAAGCCAC
 901 CTCTTTGGAG GGTGCGCTCT CTGGCACGCG CCACTCCAC CCATCCGTGG
 951 GCCGCCAGCA CCACGCGGGC CCCCCATCCA CATCGCGGCC ACCACGTCCT
 1001 GGGACACGCC TTGTCCCCCG GTGTACGCCG AGACCAAGCA CTTCCTCTAC
 1051 TCCTCAGGCG ACAAGNACAC TGCGNCCCTC CTTCCTACTC AATATATCTG
 1101 AGGCCCAGCC TGAAGGCGT TCGGGAGGTT CGTGGAGACA NTCTTTCTGG
 1151 TTCCAGGCCT TGGATGCCAG GATTCCCCGC AGGTTGCCCC GCCTGCCCCA
 1201 GCGNTACTGG CAAATGCGGC CCCTGTTTCT GGAGCTGCTT GGGAAACCAG
 1251 CGCAGTGCCC CTACGGGGTG TTCCTCAAGA CGCACTGCCC GCTGCGAGCT
 1301 GCGGTACCC CAGCAGCCGG TGTCTGTGCC CGGGAGAAGC CCCAGGGCTC
 1351 TGTGGCGGCC CCCGAGGAGG AGGAACACAG ACCCCCGTCG CCTGGTGCAG
 1401 CTGCTCCGCC AGCACAGCAG CCCCTGGCAG GTGTACGGCT TCGTGCGGGC
 1451 CTGCTGCGC CGGCTGGTGC CCCAGGCCT CTGGGGCTCC AGGCACAACG
 1501 AACGCCGCTT CCTCAGGAAC ACCAAGAAGT TCATCTCCCT GGGGAAGCAT
 1551 GCCAAGCTCT CGCTGCAGGA GCTGACGTGG AAGATGAGCG TGCGGGACTG
 1601 CGCTTGGCTG CGCAGGAGCC CAGGGGTTGG CTGTGTTCCG GCCGCAGAGC
 1651 ACCGTCTGCG TGAGGAGATC CTGGCCAAGT TCCTGCACTG GCTGATGAGT
 1701 GTGTACGTCG TCGAGCTGCT CAGGTCTTTC TTTTATGTCA CGGAGACCAC
 1751 GTTTCAAAAG AACAGGCTCT TTTTCTACCG GAAGAGTGTC TGGAGCAAGT
 1801 TGCAAAGCAT TGAATCAGA CAGCACTTGA AGAGGGTGCA GCTGCGGGAG
 1851 CTGTCGGAAG CAGAGGTCAG GCAGCATCGG GAAGCCAGGC CCGCCCTGCT
 1901 GACGTCCAGA CTCCGCTTCA TCCCAAGCC TGACGGGCTG CGGCCGATTG
 1951 TGAACATGGA CTACGTCGTG GGAGCCAGAA CGTTCCGCAG AGAAAAGAGG
 2001 GCCGAGCGTC TCACCTCGAG GGTGAAGGCA CTGTTACGCG TGCTCAACTA
 2051 CGAGCGGGCG CGGCGCCCCG GCCTCCTGGG CGCCTCTGTG CTGGGCCTGG
 2101 ACGATATCCA CAGGGCCTGG CGCACCTTCG TGCTGCGTGT GCGGGCCCAG
 2151 GACCCGCCGC CTGAGCTGTA CTTTGTCAAG GTGGATGTGA CGGGCGCGTA
 2201 CGACACCATC CCCCAGGACA GGCTCACGGA GGTCATCGCC AGCATCATCA
 2251 AACCCAGAA CACGTACTGC GTGCGTCGGT ATGCCGTGGT CCAGAAGGCC

FIGURE 50 (cont.)

2301 GCCCATGGGC ACGTCCGCAA GGCCTTCAAG AGCCACGTCT CTACCTTGAC
 2351 AGACCTCCAG CCGTACATGC GACAGTTCGT GGCTCACCTG CAGGANAACA
 2401 GCCCCTGAG GGATGCCGTC GTCATCGAGC AGAGCTCCTC CCTGAATGAG
 2451 GCCAGCAGTG GCCTCTTCGA CGTCTTCCTA CGCTTCATGT GCCACCACGC
 2501 CGTGCGCATC AGGGGCAAGT CCTACGTCCA GTGCCAGGGG ATCCCGCAGG
 2551 GCTCCATCCT CTCCACGCTG CTCTGCAGCC TGTGCTACGG CGACATGGAG
 2601 AACAAGCTGT TTGCGGGGAT TCGGCGGGAC GGGCTGCTCC TGC GTTTGGT
 2651 GGATGATTTT TTGTTGGTGA CACCTCACCT CACCCACGCG AAAACCTTCC
 2701 TCAGGACCCT GGTCCGAGGT GTCCCTGAGT ATGGCTGCGT GGTGAACTTG
 2751 CGGAAGACAG TGGTGAACCT CCCTGTAGAA GACGAGGCC TGGGTGGCAC
 2801 GGCTTTTGT CAGATGCCGG CCCACGGCCT ATTCCCCTGG TGC GGCCCTGC
 2851 TGCTGGATAC CCGGACCCTG GAGGTGCAGA GCGACTACTC CAGCTATGCC
 2901 CGGACCTCCA TCAGAGCCAG TCTCACCTT AACC GCGGCT TCAAGGCTGG
 2951 GAGGAACATG CGTCGCAAAC TCTTTGGGGT CTTGCGGCTG AAGTGT CACA
 3001 GCCTGTTTCT GGATTTGCAG GTGAACAGCC TCCAGACGGT GTGCACCAAC
 3051 ATCTACAAGA TCCTCTGCT GCAGGCGTAC AGGTTTCACG CATGTGTGCT
 3101 GCAGCTCCCA TTTCATCAGC AAGTTTGGAA GAACCCACACA TTTTTCCTGC
 3151 GCGTCATCTC TGACACGGCC TCCCTCTGCT ACTCCATCCT GAAAGCCAAG
 3201 AACGCAGGGA TGTCGCTGGG GGCCAAGGGC GCCGCCGGCC CTCTGCCCTC
 3251 CGAGGCCGTG CAGTGGCTGT GCCACCAAGC ATTCTGCTC AAGCTGACTC
 3301 GACACCGTGT CACCTACGTG CCACTCCTGG GGTCACTCAG GACAGCCCAG
 3351 ACGCAGCTGA GTCGGAAGCT CCCGGGGACG ACGCTGACTG CCCTGGAGGC
 3401 CGCAGCCAAC CCGGCACTGC CCTCAGACTT CAAGACCATC CTGGACTGAT
 3451 GGCCACCCGC CCACAGCCAG GCCGAGAGCA GACACCAGCA GCCCTGTCAC
 3501 GCCGGGCTCT ACGTCCCAGG GAGGGAGGGG CGGCCACAC CCAGGCCCGC
 3551 ACCGCTGGGA GTCTGAGGCC TGAGTGAGTG TTTGGCCGAG GCCTGCATGT
 3601 CCGGCTGAAG GCTGAGTGT CCGCTGAGGC CTGAGCGAGT GTCCAGCCAA
 3651 GGGCTGAGTG TCCAGCACAC CTGCCGTCTT CACTTCCCCA CAGGCTGGCG
 3701 CTCGGCTCCA CCCCAGGGCC AGCTTTTCCT CACCAGGAGC CCGGCTTCCA
 3751 CTCCCCACAT AGGAATAGTC CATCCCCAGA TTCGCCATTG TTCACCCCTC
 3801 GCCCTGCCCT CCTTTGCCCT CCACCCCAAC CATCCAGGTG GAGACCCTGA
 3851 GAAGGACCCT GGGAGCTCTG GGAATTTGGA GTGACCAAAG GTGTGCCCTG
 3901 TACACAGGCG AGGACCCTGC ACCTGGATGG GGGTCCCTGT GGGTCAAATT
 3951 GGGGGGAGGT GCTGTGGGAG TAAAATACTG AATATATGAG TTTTTCAGTT
 4001 TTGAAAAAAAA AAAAAAAAAA AAAAAAAAAA

[illegible]

১৮

[illegible]

A P A Q H G D R R T A G E F G V G A A A A
 B L P N T V T D A L R G S G A W G L L L N -
 C C P T R * P T H C C G A G R G G C C C A -

P R C R R R A G S P A G T L R ? ? C A G -
 R V G D D V L V H L L A R C A ? F V L V -
 A W A T T C W F T C W H A A R ? I C W W

G S Q L R L P ? V R A A A V P A R R C ?
 P P S C A Y ? V C G P P L Y Q L G A A T
 P P A A P T ? C A G R R C T S S A L ? L

a S G P A P A T R ? W T R ? R L G S N G P
b Q A R P P P H A ? G P E ? V W D F T G L
c R P G P R H T L ? D F ? A S G I Q R A W

H G T I A S C R P C S P W A A S P G C E E
 D E P * R Q G G R C P P G L P A F G A R R
 C N H S V R E A G V P L G C Q P R V R G G

A R G Q C Q P K S A V A Q E A Q A W R C
 R G G S A S R S L P L P K R P R R G A A
 A G A V F A E V C R C P R G F G V A L ?

G P - A C A D A R W A C V L G F F G Q D A
 D P E P E R T P V G Q G S W A H P C R T F
 C L S R S G R P L G R G P G P T R A C R L

[illegible]

A P L A N A A P V S G A A W E P R A V F -
R Y W Q M R F L F L E L L G N H A Q C F -
P T G K C G P C F W S C L G T T K S A F

[illegible]

1261 1320

CAATGCCCCACAAAGGAGTTCTGCGTGACGCGCGACGCTCGACGCCAGTGGGGTGSTGGGCT

L R G V F Q D A L F A A S C G H F S S R -
Y G V F L K T H C P L R A A V T F A A G -
T G C S S R R T A R C E L R S P Q Q F V -

TGTCGTGTGCCCGGGAGAAAGCCCGAGGGCTCTGTGTGGCGCCCCCGAGGAGGAGGGAACACAG

1321
ACAGACACGGGCGCTCTTCGGGGTCCCGAGACACCGCCGGGGCTCTCTCTCTCTGTGTC 1380

C L C P G E A P G I C G G P R G G G T Q -
 V C A K E K P Q G S V A A P E E E E H R -
 S V P G R S P R A I W R P F F R R R N T D -

ACCGCGGTGCGCTGGTGCAGCTGCTCCGGCAGCA.CAGCAGGCGCTGGCAGGTGTACGGCT

1381
TGGGGCCAGCGGACCAAGTCGACGAGGGCGTTCGTGTGTCGCGGACCGTCCACATGCGGA 1440

a T F V A W C S C S A S T I A P G E C T A -
b P P S P G A A A P P A Q Q P L A G V R L -
c P R R L V O L L R Q H S S P W Q V Y G F

TTGTTGGGGCTTGCCTGGCGCGCTGGTGCCGCCAGGCCCTCTGGGGCTCCAGGCACAACT

1441
 ATGTAAGTCCCGGACGGAGACCGGCGAACCACGGGGTTCCTGAGACCCCGAGGTTCCTGATGTGC 1500

S C G P A C A G W C P Q A S G A F G T T
 R A G L F A P A G A P H P L G I Q A Q R
 V R A C L R R L V P P C L W G S R H N E

AATGCGCTTTCCTCAGGAACACCAAGAAGTTCATCTCCTCTGGGGAAGCATGCGAAGCTCT

1501
TTSCYCGAAGGAGTCTCTGTGGTTCTTCACTAGACGGACCCCTTCGTACGGTTCGAGA 1560

N A A S S G T P R S S S P W G S M P S S
 T P L P Q E H Q E V H L P G E A C Q A L
 R R F L R N T K K F I S L G K H A K L S

CGCTTCAGGAGCTGACGTGGAAGATGAGCGTSCGGGACTGCGCTTGGCTGCCCGAGGAGCC

1561 -----+----- 1620
 -CGAAGTCTCTCGACTGCACCTTCTACTCGGCAGCCCTGACGCGAAACCGAGCGSTCTCTGG-

3 R C R S * R G R * A C G T A L C C A G A
D A A G A D V E D E R A G L R L A A Q E P
C L Q E L T W K M S V R D C A W L R R S P

CAGCGGTTGGCTGTGTTCCGGCCGCAGAGCACCGTCTCCCTTAGCAGATCTCTGGTCAAG

GTCCCTACCGACACAAGGCGGGTGTCGTGGCAGACGCACCTCTCTAGGACCGGTTCA

Q G L A V F R P Q S T V C V R R S W T S
R G W L C S C R R A T S A * G D P G Q V
G V G C V F A A E H R L R E E I L A K =

| Year | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 | 2042 | 2043 | 2044 | 2045 | 2046 | 2047 | 2048 | 2049 | 2050 | 2051 | 2052 | 2053 | 2054 | 2055 | 2056 | 2057 | 2058 | 2059 | 2060 | 2061 | 2062 | 2063 | 2064 | 2065 | 2066 | 2067 | 2068 | 2069 | 2070 | 2071 | 2072 | 2073 | 2074 | 2075 | 2076 | 2077 | 2078 | 2079 | 2080 | 2081 | 2082 | 2083 | 2084 | 2085 | 2086 | 2087 | 2088 | 2089 | 2090 | 2091 | 2092 | 2093 | 2094 | 2095 | 2096 | 2097 | 2098 | 2099 | 2100 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 | 2042 | 2043 | 2044 | 2045 | 2046 | 2047 | 2048 | 2049 | 2050 | 2051 | 2052 | 2053 | 2054 | 2055 | 2056 | 2057 | 2058 | 2059 | 2060 | 2061 | 2062 | 2063 | 2064 | 2065 | 2066 | 2067 | 2068 | 2069 | 2070 | 2071 | 2072 | 2073 | 2074 | 2075 | 2076 | 2077 | 2078 | 2079 | 2080 | 2081 | 2082 | 2083 | 2084 | 2085 | 2086 | 2087 | 2088 | 2089 | 2090 | 2091 | 2092 | 2093 | 2094 | 2095 | 2096 | 2097 | 2098 | 2099 | 2100 | |

TCTTCACTGCGCAGTAGGTGGTAQCTGCTGAGCTGCAGGTCTTTTCTTTATGTGA
1681 -----+----- 1740
AGGACGTGACCGACTACTTCACACATCCAGCACCTCGACGAGTGCCAGAAACAATAACAT

a S C T G * V C T S S S C S C L S F M S -
b F A I A D E C V R R R A A Q V F L L C H -
c L H W I M S V Y V E L L R S F F Y V T -

CCGAGACCAGSTTTCAAAGAACAGGCTCTTTTTCTACCGGAAGAGTGTCTGAGGCAAGT
1741 -----+----- 1800
GCCCTCTGGTGCAAAGTTTCTTCTCGAGAAAAAGATCGCCTTCTCACASACCTCGTTCA

a R R P R P K R T G S F S T G R V S G A S -
b G D H V S K E Q A L F L P E E C L E Q V -
c E T T F Q K N R L P F Y R K S V W S K L -

TGCAAACCATITGGAATCAGACAGCACTTGAAGAGGGTGCACTGCGGGAGCTGTGGAAG
1801 -----+----- 1860
ACGTTTCTGTAACTTAGTCTGTCTGTAACCTTCTCCACGTCGACGCGCTCGACAGCCTTC

a C K A L E S D S T * R G C S C G S C R K -
b A K H W N Q T A L E E C A A A C A V G S -
c Q S T G T R Q H L K R V Q L R E L S E A -

CAGAGTICAGSCAGCATCGGGAAGCCAGGCCCCCGCTGCTGACGTCCAGACTCCGCTTCA
1861 -----+----- 1920
GTCTCCACTCCCTCGTAGCCCTTCGGTCCGGGCGGCACGACTCCAGGTCTCAGCCCAAGT

a Q R S G S I G K P G P P C * R P D S A S -
b R G Q A A S C S Q A R P A D V Q T P L H -
c E V R Q H R E A R P A L L T S R L R F I -

TCCCCAGCCTGACGGGCTGCGGCGGATTGTGACATGGACTACGTCTGTTGGAGCCAGAA
1921 -----+----- 1980
AGGGGTTGCGACTCCCGACGCGGGCTAACACTTGTTCCTGATGACAGCACCTCGGTCTT

a S P S L T G C G R L * T W T T S W E P E -
b P Q A * R A A A D C E H C L R R G S Q N -
c P K P D G L R P I V N M D Y V V G A R T

GTTTUGCAGAGAAAAGAGGGCCGAGCGTCTCACCTCGAGGGTGAAGGCACTGTTCAGGG
1981 -----+----- 2040
GCAAGGGTCTCTTTTCTCCCGGCTGCGAGAGTGGAGCTCCCACTTCCGTGACAAAGTCC

a R S A E K R C P S V S P K G * R H C S A -
b V P Q R K E G R A S H L E G E G T V Q R -
c F R R E K R A E R L T S R V K A L F S V -

TGCTCACTAGCAACCGGCGCGCGCGCTCCGCGGCTCTGTGCTGGGCTG
2041 -----+----- 2100
ACGAGTTGATCTCTAGCCCGCGCGCGCGCGCGGAGCACCCCGGAGACACGACTCGGACT

a C S T T S G R G A P A S W A P L C W A W -
b A Q L R A G A A P K P P G R L C A G P G -
c L N Y E S A R R P G L L G A S V L G I D -

[illegible]

T I S T G P G A P S C C V C G F R T R R -
R Y F Q G L A H L R A A C A G P G P A A -
D I H S A W R T F V L R V R A O D F F P -

1 S C T L S R W M * R A R T T P S F R T -
 2 * A V L C Q G G C D G R V R H H P P G Q
 3 E L Y F V K V D V T G A Y D T I P O D K -

A G S R R S S P A S S N P R T R T A C V G -
 B A H G G H R Q H H Q T P E H V L R A S V -
 C L T E V I A S I I K P Q N T Y C V R R Y

A M P W S R R P P M G T S A R P S R A T S -
 B C R G P E C R P W A R P Q G L Q E F R L -
 C A V V O K A A H G H V R K A F K S H V S

L P . Q T S S R T C D S S W L T C R P T -
Y L D R P P A V H A T V R G S P A G ? Q -
T L T D L Q P Y M R O F V A H L Q ? N S

A R * G M P S S S S R A P P * M R P A V
P A E G C R R H R A E L L P E * G Q Q W
P L R D A V V I E O S S S L N E A S S G

A S S T S S Y A S C A T T P C A S G A S
P L R R L P T L H V P P R R A H Q G O V
L F D V F L R F M C H H A V R I R G K S

[illegible]

A T T P A M F G P P S E P V S P S T A A -
 R L L Q L C F D L H Q S Q S H L Q P R L -
 D Y S S Y A R T S I R A S L T E N R G F -

| Year | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 | 2042 | 2043 | 2044 | 2045 | 2046 | 2047 | 2048 | 2049 | 2050 | 2051 | 2052 | 2053 | 2054 | 2055 | 2056 | 2057 | 2058 | 2059 | 2060 | 2061 | 2062 | 2063 | 2064 | 2065 | 2066 | 2067 | 2068 | 2069 | 2070 | 2071 | 2072 | 2073 | 2074 | 2075 | 2076 | 2077 | 2078 | 2079 | 2080 | 2081 | 2082 | 2083 | 2084 | 2085 | 2086 | 2087 | 2088 | 2089 | 2090 | 2091 | 2092 | 2093 | 2094 | 2095 | 2096 | 2097 | 2098 | 2099 | 2100 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 | 2042 | 2043 | 2044 | 2045 | 2046 | 2047 | 2048 | 2049 | 2050 | 2051 | 2052 | 2053 | 2054 | 2055 | 2056 | 2057 | 2058 | 2059 | 2060 | 2061 | 2062 | 2063 | 2064 | 2065 | 2066 | 2067 | 2068 | 2069 | 2070 | 2071 | 2072 | 2073 | 2074 | 2075 | 2076 | 2077 | 2078 | 2079 | 2080 | 2081 | 2082 | 2083 | 2084 | 2085 | 2086 | 2087 | 2088 | 2089 | 2090 | 2091 | 2092 | 2093 | 2094 | 2095 | 2096 | 2097 | 2098 | 2099 | 2100 | |

[illegible]

FIGURE 51 (cont.)

3361 ----- 3420
 CTGGGAAGCTCCCGG3GACGAGCTGACTGCOCTGGA33CGCGCAGCCACCCU3CACTGC
 CAGCCTTCGAGG3GCOOCTGCTGCGACTGACGG3ACCTCCCGOCTCCOCTTOLGCGUGIACG

a V G S S R G R R * I F W R P Q F T R H C -
 b S E A P G D D A D C P G G R S Q P G T A -
 c R K L P G T T L T A L E A A A N P A L P -

3421 ----- 3480
 CCTCAGACITCAAGACCAITCTTGACTGATG3CCACCCGCCACAGCCAGGCGAGAGCA
 GGAGTCTGAAGTTCGTG3TAGGACCTGACTACCGGTGGCGGGTGTCTG3TCCOCTCTCTCT

a P Q T S R P S W T D G H P F T A R P R A -
 b L R L Q D H P G L M A T E P Q F G R E Q -
 c S D F K T I L D * W P F A H S Q A E S R -

3481 ----- 3540
 GACACCAGCAGCCCTCTCAO3CGGGCTCTACGTCCAGGGAGGGAGGGGCGGCCACAC
 CTGTG3TCTGTCGGGACAGTCCCGGCCGAGATG3CAGGGTCCCTCCCTCCO3CGGGTGTG

a D T S S P V T P G S T S Q G G R G G P H -
 b T P A A L S R R A L R P R E G G A A H T -
 c H Q Q P C H A G L Y V P G R E G R P T P -

3541 ----- 3600
 CCAGG3CCG3CACCGCTCGGAGTCTCAO3COCTGAGTGA3TGT3TTG3COGAGGCOCTGCATGT
 GGTCC3GGCGTGGCGACCCCTCAGACTCO3GACTCACTCACA3ACCGGCTCCGGACGTACA

a P G P H R W E S E A * V S V W P R P A C -
 b Q A R T A G S L R P E * V F G R G L H V -
 c R P A P L G V * G L S E C L A E A C M S -

3601 ----- 3660
 CCGGCT3AAG3CTGAGTGTTCGGCTGAGGCC3GAGCGAGTCTCCAGCC3AAGGCTGAGT3
 GGGCGACTTCCGACTCACA3GCGGACTCCGGACTCGCTCAGAGTGG3TTCCCGACTCAC

a P A E G * V S G * G L S E C P A K C * V -
 b R L F A E C P A E A * A S V Q P R A E C -
 c G * R L S V R L R P E R V S S Q G L S V -

3661 ----- 3720
 TTCAG3ACACCT3COGTCTTCACTTCCCCACAG3CTG3CGCTCGGCTCCACCTCCAGGGCC
 AGGTCTGTG3GACGGCAGAGT3A3ACCGCTGTCCGACCG3AGCCGAGGTGG3TCCCG3

a S S T P A V F T S P Q A G A R L H P R A -
 b P A H L P S S L P H R L A L G S T P G P -
 c Q H T C R L H F P T G W R S A P P Q G Q -

3721 ----- 3780
 AGCTTTTCTCAC3AGCCCGGCTTCCACTCCCCACATA3GAATAGTTCATCC3CAGA
 TCGAA3GGAGT3GTCTCGG3CCGAAGGT3AGGGT3G3ATCTCTATCAGCTACCGGTCT

a S F S S P G A R L P L P T * E * S T P E
 b A P P H Q E P G F H S P H R N S P S P D -
 c L F L T R S P A S T P H I G I V H F Q T -

200110 257500 0100

| | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 | 2042 | 2043 | 2044 | 2045 | 2046 | 2047 | 2048 | 2049 | 2050 | 2051 | 2052 | 2053 | 2054 | 2055 | 2056 | 2057 | 2058 | 2059 | 2060 | 2061 | 2062 | 2063 | 2064 | 2065 | 2066 | 2067 | 2068 | 2069 | 2070 | 2071 | 2072 | 2073 | 2074 | 2075 | 2076 | 2077 | 2078 | 2079 | 2080 | 2081 | 2082 | 2083 | 2084 | 2085 | 2086 | 2087 | 2088 | 2089 | 2090 | 2091 | 2092 | 2093 | 2094 | 2095 | 2096 | 2097 | 2098 | 2099 | 2100 | 2101 | 2102 | 2103 | 2104 | 2105 | 2106 | 2107 | 2108 | 2109 | 2110 | 2111 | 2112 | 2113 | 2114 | 2115 | 2116 | 2117 | 2118 | 2119 | 2120 | 2121 | 2122 | 2123 | 2124 | 2125 | 2126 | 2127 | 2128 | 2129 | 2130 | 2131 | 2132 | 2133 | 2134 | 2135 | 2136 | 2137 | 2138 | 2139 | 2140 | 2141 | 2142 | 2143 | 2144 | 2145 | 2146 | 2147 | 2148 | 2149 | 2150 | 2151 | 2152 | 2153 | 2154 | 2155 | 2156 | 2157 | 2158 | 2159 | 2160 | 2161 | 2162 | 2163 | 2164 | 2165 | 2166 | 2167 | 2168 | 2169 | 2170 | 2171 | 2172 | 2173 | 2174 | 2175 | 2176 | 2177 | 2178 | 2179 | 2180 | 2181 | 2182 | 2183 | 2184 | 2185 | 2186 | 2187 | 2188 | 2189 | 2190 | 2191 | 2192 | 2193 | 2194 | 2195 | 2196 | 2197 | 2198 | 2199 | 2200 | 2201 | 2202 | 2203 | 2204 | 2205 | 2206 | 2207 | 2208 | 2209 | 2210 | 2211 | 2212 | 2213 | 2214 | 2215 | 2216 | 2217 | 2218 | 2219 | 2220 | 2221 | 2222 | 2223 | 2224 | 2225 | 2226 | 2227 | 2228 | 2229 | 2230 | 2231 | 2232 | 2233 | 2234 | 2235 | 2236 | 2237 | 2238 | 2239 | 2240 | 2241 | 2242 | 2243 | 2244 | 2245 | 2246 | 2247 | 2248 | 2249 | 2250 | 2251 | 2252 | 2253 | 2254 | 2255 | 2256 | 2257 | 2258 | 2259 | 2260 | 2261 | 2262 | 2263 | 2264 | 2265 | 2266 | 2267 | 2268 | 2269 | 2270 | 2271 | 2272 | 2273 | 2274 | 2275 | 2276 | 2277 | 2278 | 2279 | 2280 | 2281 | 2282 | 2283 | 2284 | 2285 | 2286 | 2287 | 2288 | 2289 | 2290 | 2291 | 2292 | 2293 | 2294 | 2295 | 2296 | 2297 | 2298 | 2299 | 2300 | 2301 | 2302 | 2303 | 2304 | 2305 | 2306 | 2307 | 2308 | 2309 | 2310 | 2311 | 2312 | 2313 | 2314 | 2315 | 2316 | 2317 | 2318 | 2319 | 2320 | 2321 | 2322 | 2323 | 2324 | 2325 | 2326 | 2327 | 2328 | 2329 | 2330 | 2331 | 2332 | 2333 | 2334 | 2335 | 2336 | 2337 | 2338 | 2339 | 2340 | 2341 | 2342 | 2343 | 2344 | 2345 | 2346 | 2347 | 2348 | 2349 | 2350 | 2351 | 2352 | 2353 | 2354 | 2355 | 2356 | 2357 | 2358 | 2359 | 2360 | 2361 | 2362 | 2363 | 2364 | 2365 | 2366 | 2367 | 2368 | 2369 | 2370 | 2371 | 2372 | 2373 | 2374 | 2375 | 2376 | 2377 | 2378 | 2379 | 2380 | 2381 | 2382 | 2383 | 2384 | 2385 | 2386 | 2387 | 2388 | 2389 | 2390 | 2391 | 2392 | 2393 | 2394 | 2395 | 2396 | 2397 | 2398 | 2399 | 2400 | 2401 | 2402 | 2403 | 2404 | 2405 | 2406 | 2407 | 2408 | 2409 | 2410 | 2411 | 2412 | 2413 | 2414 | 2415 | 2416 | 2417 | 2418 | 2419 | 2420 | 2421 | 2422 | 2423 | 2424 | 2425 | 2426 | 2427 | 2428 | 2429 | 2430 | 2431 | 2432 | 2 |
|--|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|---|
|--|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|---|

```

A      F A I V H F S P C P P L P S T P T I Q V -
B      S E L F T P R P A L L C L P F F F S R W -
C      R H C S P L A L P S F A F H P H H F G G -

```

A F T L E R T L G A L G I W S D Q R C A L -
 B F S * E G P W E L W E F G V T K G V P C -
 C D P E E D T G S S C N L E * P K V C P V

```

A      Y T G E D P A P G W G S L W V K L G G C -
B      T O A R T L H L D G G P C G S N W G E V -
C      H R R C P C T W M C V P V G Q I G G E C

```

A V G V K Y * I Y E F F S F E K K K K K
L W E * N T E Y M S F S V L K K K K K K
C G S K I L N I * V F O P * K K K K K K -

| | | | | |
|---|---|---|---|---|
| A | K | K | K | - |
| B | K | K | | - |
| C | K | K | | - |

FIGURE 52

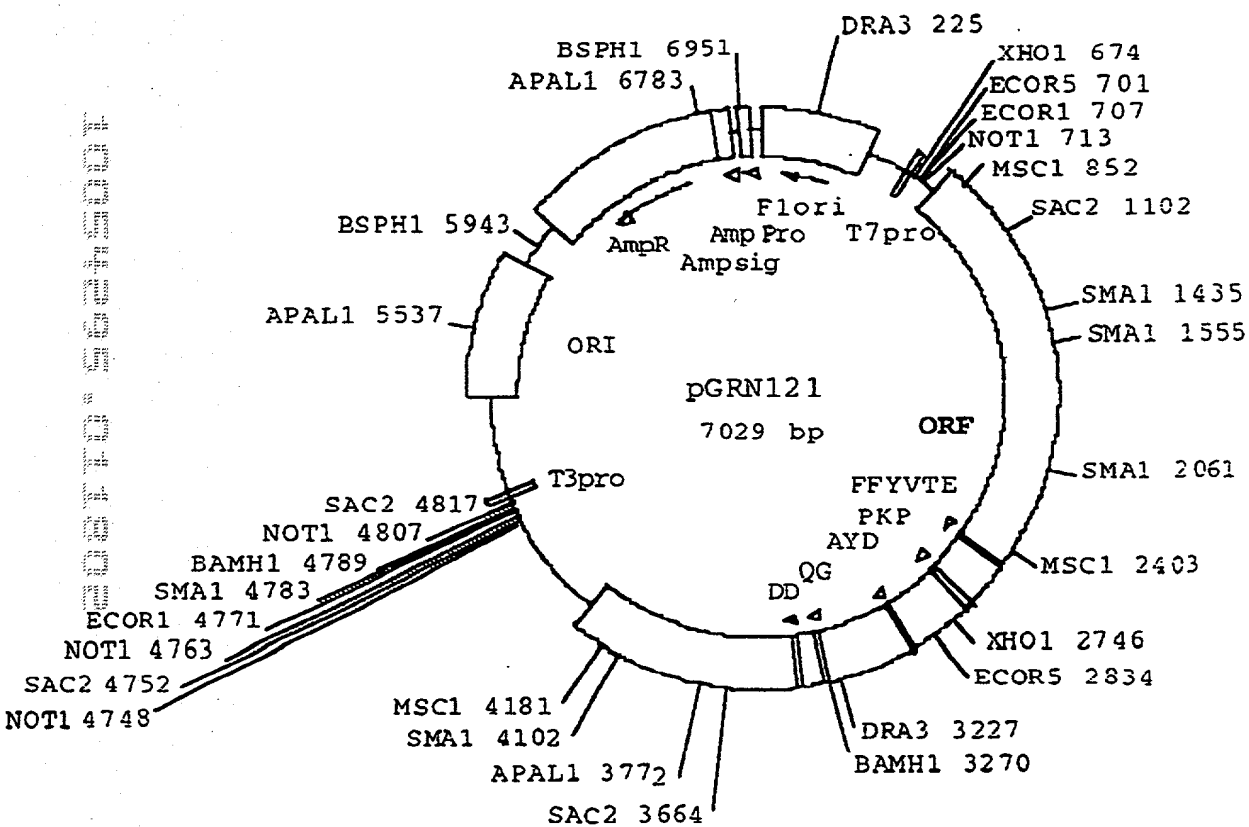


FIGURE 53

1
 met
 GCAGCGCTGCGTCCTGCTGCGCACGTGGGAAGCCCTGGCCCCGGCCACCCCCGCG ATG
 10
 pro arg ala pro arg cys arg ala val arg ser leu leu arg ser
 CCG CGC GCT CCC CGC TGC CGA GCC GTG CGC TCC CTG CTG CGC AGC
 20 30
 his tyr arg glu val leu pro leu ala thr phe val arg arg leu
 CAC TAC CGC GAG GTG CTG CCG CTG GCC ACG TTC GTG CGG CGC CTG
 40
 gly pro gln gly trp arg leu val gln arg gly asp pro ala ala
 GGG CCC CAG GGC TGG CGG CTG GTG CAG CGC GGG GAC CCG GCG GCT
 50 60
 phe arg ala leu val ala gln cys leu val cys val pro trp asp
 TTC CGC GCG CTG GTG GCC CAG TGC CTG GTG TGC GTG CCC TGG GAC
 70
 ala arg pro pro pro ala ala pro ser phe arg gln val ser cys
 GCA CGG CCG CCC CCC GCC GCC CCC TCC TTC CGC CAG GTG TCC TGC
 80 90
 leu lys glu leu val ala arg val leu gln arg leu cys glu arg
 CTG AAG GAG CTG GTG GCC CGA GTG CTG CAG AGG CTG TGC GAG CGC
 100
 gly ala lys asn val leu ala phe gly phe ala leu leu asp gly
 GGC GCG AAG AAC GTG CTG GCC TTC GGC TTC GCG CTG CTG GAC GGG
 110 120
 ala arg gly gly pro pro glu ala phe thr thr ser val arg ser
 GCC CGC GGG GGC CCC CCC GAG GCC TTC ACC ACC AGC GTG CGC AGC
 ↑
 130
 tyr leu pro asn thr val thr asp ala leu arg gly ser gly ala
 TAC CTG CCC AAC ACG GTG ACC GAC GCA CTG CGG GGG AGC GGG GCG

FIGURE 53 (cont.)

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| | | | 140 | | | | | | | | | | 150 | | |
| trp | gly | leu | leu | leu | arg | arg | val | gly | asp | asp | val | leu | val | his | |
| TGG | GGG | CTG | CTG | CTG | CGC | CGC | GTG | GGC | GAC | GAC | GTG | CTG | GTT | CAC | |
| | | | | | | | | 160 | | | | | | | |
| leu | leu | ala | arg | cys | ala | leu | phe | val | leu | val | ala | pro | ser | cys | |
| CTG | CTG | GCA | CGC | TGC | GCG | CTC | TTT | GTG | CTG | GTG | GCT | CCC | AGC | TGC | |
| | | | 170 | | | | | | | | | | 180 | | |
| ala | tyr | gln | val | cys | gly | pro | pro | leu | tyr | gln | leu | gly | ala | ala | |
| GCC | TAC | CAG | GTG | TGC | GGG | CCG | CCG | CTG | TAC | CAG | CTC | GGC | GCT | GCC | |
| | | | | | | | | 190 | | | | | | | |
| thr | gln | ala | arg | pro | pro | pro | his | ala | ser | gly | pro | arg | arg | arg | |
| ACT | CAG | GCC | CGG | CCC | CCG | CCA | CAC | GCT | AGT | GGA | CCC | CGA | AGG | CGT | |
| | | | 200 | | | | | | | | | | 210 | | |
| leu | gly | cys | glu | arg | ala | trp | asn | his | ser | val | arg | glu | ala | gly | |
| CTG | GGA | TGC | GAA | CGG | GCC | TGG | AAC | CAT | AGC | GTC | AGG | GAG | GCC | GGG | |
| | | | | | | | | 220 | | | | | | | |
| val | pro | leu | gly | leu | pro | ala | pro | gly | ala | arg | arg | arg | gly | gly | |
| GTC | CCC | CTG | GGC | CTG | CCA | GCC | CCG | GGT | GCG | AGG | AGG | CGC | GGG | GGC | |
| | | | 230 | | | | | | | | | | 240 | | |
| ser | ala | ser | arg | ser | leu | pro | leu | pro | lys | arg | pro | arg | arg | gly | |
| AGT | GCC | AGC | CGA | AGT | CTG | CCG | TTG | CCC | AAG | AGG | CCC | AGG | CGT | GGC | |
| | | | | | | | | 250 | | | | | | | |
| ala | ala | pro | glu | pro | glu | arg | thr | pro | val | gly | gln | gly | ser | trp | |
| GCT | GCC | CCT | GAG | CCG | GAG | CGG | ACG | CCC | GTT | GGG | CAG | GGG | TCC | TGG | |
| | | | 260 | | | | | | | | | | 270 | | |
| ala | his | pro | gly | arg | thr | arg | gly | pro | ser | asp | arg | gly | phe | cys | |
| GCC | CAC | CCG | GGC | AGG | ACG | CGT | GGA | CCG | AGT | GAC | CGT | GGT | TTC | TGT | |
| | | | | | | | | 280 | | | | | | | |
| val | val | ser | pro | ala | arg | pro | ala | glu | glu | ala | thr | ser | leu | glu | |
| GTG | GTG | TCA | CCT | GCC | AGA | CCC | GCC | GAA | GAA | GCC | ACC | TCT | TTG | GAG | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1947 | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 | 2042 | 2043 | 2044 | 2045 | 2046 | 2047 | 2048 | 2049 | 2050 | 2051 | 2052 | 2053 | 2054 | 2055 | 2056 | 2057 | 2058 | 2059 | 2060 | 2061 | 2062 | 2063 | 2064 | 2065 | 2066 | 2067 | 2068 | 2069 | 2070 | 2071 | 2072 | 2073 | 2074 | 2075 | 2076 | 2077 | 2078 | 2079 | 2080 | 2081 | 2082 | 2083 | 2084 | 2085 | 2086 | 2087 | 2088 | 2089 | 2090 | 2091 | 2092 | 2093 | 2094 | 2095 | 2096 | 2097 | 2098 | 2099 | 2100 | 2101 | 2102 | 2103 | 2104 | 2105 | 2106 | 2107 | 2108 | 2109 | 2110 | 2111 | 2112 | 2113 | 2114 | 2115 | 2116 | 2117 | 2118 | 2119 | 2120 | 2121 | 2122 | 2123 | 2124 | 2125 | 2126 | 2127 | 2128 | 2129 | 2130 | 2131 | 2132 | 2133 | 2134 | 2135 | 2136 | 2137 | 2138 | 2139 | 2140 | 2141 | 2142 | 2143 | 2144 | 2145 | 2146 | 2147 | 2148 | 2149 | 2150 | 2151 | 2152 | 2153 | 2154 | 2155 | 2156 | 2157 | 2158 | 2159 | 2160 | 2161 | 2162 | 2163 | 2164 | 2165 | 2166 | 2167 | 2168 | 2169 | 2170 | 2171 | 2172 | 2173 | 2174 | 2175 | 2176 | 2177 | 2178 | 2179 | 2180 | 2181 | 2182 | 2183 | 2184 | 2185 | 2186 | 2187 | 2188 | 2189 | 2190 | 2191 | 2192 | 2193 | 2194 | 2195 | 2196 | 2197 | 2198 | 2199 | 2200 | 2201 | 2202 | 2203 | 2204 | 2205 | 2206 | 2207 | 2208 | 2209 | 2210 | 2211 | 2212 | 2213 | 2214 | 2215 | 2216 | 2217 | 2218 | 2219 | 2220 | 2221 | 2222 | 2223 | 2224 | 2225 | 2226 | 2227 | 2228 | 2229 | 2230 | 2231 | 2232 | 2233 | 2234 | 2235 | 2236 | 2237 | 2238 | 2239 | 2240 | 2241 | 2242 | 2243 | 2244 | 2245 | 2246 | 2247 | 2248 | 2249 | 2250 | 2251 | 2252 | 2253 | 2254 | 2255 | 2256 | 2257 | 2258 | 2259 | 2260 | 2261 | 2262 | 2263 | 2264 | 2265 | 2266 | 2267 | 2268 | 2269 | 2270 | 2271 | 2272 | 2273 | 2274 | 2275 | 2276 | 2277 | 2278 | 2279 | 2280 | 2281 | 2282 | 2283 | 2284 | 2285 | 2286 | 2287 | 2288 | 2289 | 2290 | 2291 | 2292 | 2293 | 2294 | 2295 | 2296 | 2297 | 2298 | 2299 | 2300 | 2301 | 2302 | 2303 | 2304 | 2305 | 2306 | 2307 | 2308 | 2309 | 2310 | 2311 | 2312 | 2313 | 2314 | 2315 | 2316 | 2317 | 2318 | 2319 | 2320 | 2321 | 2322 | 2323 | 2324 | 2325 | 2326 | 2327 | 2328 | 2329 | 2330 | 2331 | 2332 | 2333 | 2334 | 2335 | 2336 | 2337 | 2338 | 2339 | 2340 | 2341 | 2342 | 2343 | 2344 | 2345 | 2346 | 2347 | 2348 | 2349 | 2350 | 2351 | 2352 | 2353 | 2354 | 2355 | 2356 | 2357 | 2358 | 2359 | 2360 | 2361 | 2362 | 2363 | 2364 | 2365 | 2366 | 2367 | 2368 | 2369 | 2370 | 2371 | 2372 | 2373 | 2374 | 2375 | 2376 | 2377 | 2378 | 2379 | 2380 | 2381 | 2382 | 2383 | 2384 | 2385 | 2386 | 2387 | 2388 | 2389 | 2390 | 2391 | 2392 | 2393 | 2394 | 2395 | 2396 | 2397 | 2398 | 2399 | 2400 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| | | | 290 | | | | | | | | | | 300 | | |
| gly | ala | leu | ser | gly | thr | arg | his | ser | his | pro | ser | val | gly | arg | |
| GGT | GCG | CTC | TCT | GGC | ACG | CGC | CAC | TCC | CAC | CCA | TCC | GTG | GGC | CGC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | 310 | | | | | | | |
| gln | his | his | ala | gly | pro | pro | ser | thr | ser | arg | pro | pro | arg | pro | |
| CAG | CAC | CAC | GCG | GGC | CCC | CCA | TCC | ACA | TCG | CGG | CCA | CCA | CGT | CCC | |
| | | | | | | | | | | | | | | | |
| | | | 320 | | | | | | | | | | 330 | | |
| trp | asp | thr | pro | cys | pro | pro | val | tyr | ala | glu | thr | lys | his | phe | |
| TGG | GAC | ACG | CCT | TGT | CCC | CCG | GTG | TAC | GCC | GAG | ACC | AAG | CAC | TTC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | 340 | | | | | | | |
| leu | tyr | ser | ser | gly | asp | lys | glu | gln | leu | arg | pro | ser | phe | leu | |
| CTC | TAC | TCC | TCA | GGC | GAC | AAG | GAG | CAG | CTG | CGG | CCC | TCC | TTC | CTA | |
| | | | | | | | | | | | | | | | |
| | | | 350 | | | | | | | | | | 360 | | |
| leu | ser | ser | leu | arg | pro | ser | leu | thr | gly | ala | arg | arg | leu | val | |
| CTC | AGC | TCT | CTG | AGG | CCC | AGC | CTG | ACT | GGC | GCT | CGG | AGG | CTC | GTG | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | 370 | | | | | | | |
| glu | thr | ile | phe | leu | gly | ser | arg | pro | trp | met | pro | gly | thr | pro | |
| GAG | ACC | ATC | TTT | CTG | GGT | TCC | AGG | CCC | TGG | ATG | CCA | GGG | ACT | CCC | |
| | | | | | | | | | | | | | | | |
| | | | 380 | | | | | | | | | | 390 | | |
| arg | arg | leu | pro | arg | leu | pro | gln | arg | tyr | trp | gln | met | arg | pro | |
| CGC | AGG | TTG | CCC | CGC | CTG | CCC | CAG | CGC | TAC | TGG | CAA | ATG | CGG | CCC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | 400 | | | | | | | |
| leu | phe | leu | glu | leu | leu | gly | asn | his | ala | gln | cys | pro | tyr | gly | |
| CTG | TTT | CTG | GAG | CTG | CTT | GGG | AAC | CAC | GCG | CAG | TGC | CCC | TAC | GGG | |
| | | | | | | | | | | | | | | | |
| | | | 410 | | | | | | | | | | 420 | | |
| val | leu | leu | lys | thr | his | cys | pro | leu | arg | ala | ala | val | thr | pro | |
| GTG | CTC | CTC | AAG | ACG | CAC | TGC | CCG | CTG | CGA | GCT | GCG | GTC | ACC | CCA | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | 430 | | | | | | | |
| ala | ala | gly | val | cys | ala | arg | glu | lys | pro | gln | gly | ser | val | ala | |
| GCA | GCC | GGT | GTC | TGT | GCC | CGG | GAG | AAG | CCC | CAG | GGC | TCT | GTG | GCG | |

| Year | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 | 2042 | 2043 | 2044 | 2045 | 2046 | 2047 | 2048 | 2049 | 2050 | 2051 | 2052 | 2053 | 2054 | 2055 | 2056 | 2057 | 2058 | 2059 | 2060 | 2061 | 2062 | 2063 | 2064 | 2065 | 2066 | 2067 | 2068 | 2069 | 2070 | 2071 | 2072 | 2073 | 2074 | 2075 | 2076 | 2077 | 2078 | 2079 | 2080 | 2081 | 2082 | 2083 | 2084 | 2085 | 2086 | 2087 | 2088 | 2089 | 2090 | 2091 | 2092 | 2093 | 2094 | 2095 | 2096 | 2097 | 2098 | 2099 | 2100 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 | 2042 | 2043 | 2044 | 2045 | 2046 | 2047 | 2048 | 2049 | 2050 | 2051 | 2052 | 2053 | 2054 | 2055 | 2056 | 2057 | 2058 | 2059 | 2060 | 2061 | 2062 | 2063 | 2064 | 2065 | 2066 | 2067 | 2068 | 2069 | 2070 | 2071 | 2072 | 2073 | 2074 | 2075 | 2076 | 2077 | 2078 | 2079 | 2080 | 2081 | 2082 | 2083 | 2084 | 2085 | 2086 | 2087 | 2088 | 2089 | 2090 | 2091 | 2092 | 2093 | 2094 | 2095 | 2096 | 2097 | 2098 | 2099 | 2100 | |

| | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 440 | | | | | | | | | | | | | 450 | |
| ala | pro | glu | glu | glu | asp | thr | asp | pro | arg | arg | leu | val | gln | leu |
| GCC | CCC | GAG | GAG | GAG | GAC | ACA | GAC | CCC | CGT | CGC | CTG | GTG | CAG | CTG |
| 460 | | | | | | | | | | | | | | |
| leu | arg | gln | his | ser | ser | pro | trp | gln | val | tyr | gly | phe | val | arg |
| CTC | CGC | CAG | CAC | AGC | AGC | CCC | TGG | CAG | GTG | TAC | GGC | TTC | GTG | CGG |
| 470 | | | | | | | | | | | | | 480 | |
| ala | cys | leu | arg | arg | leu | val | pro | pro | gly | leu | trp | gly | ser | arg |
| GCC | TGC | CTG | CGC | CGG | CTG | GTG | CCC | CCA | GGC | CTC | TGG | GGC | TCC | AGG |
| 490 | | | | | | | | | | | | | | |
| his | asn | glu | arg | arg | phe | leu | arg | asn | thr | lys | lys | phe | ile | ser |
| CAC | AAC | GAA | CGC | CGC | TTC | CTC | AGG | AAC | ACC | AAG | AAG | TTC | ATC | TCC |
| 500 | | | | | | | | | | | | | 510 | |
| leu | gly | lys | his | ala | lys | leu | ser | leu | gln | glu | leu | thr | trp | lys |
| CTG | GGG | AAG | CAT | GCC | AAG | CTC | TGC | CTG | CAG | GAG | CTG | ACG | TGG | AAG |
| 520 | | | | | | | | | | | | | | |
| met | ser | val | arg | asp | cys | ala | trp | leu | arg | arg | ser | pro | gly | val |
| ATG | AGC | GTG | CGG | GAC | TGC | GCT | TGG | CTG | CGC | AGG | AGC | CCA | GGG | GTT |
| 530 | | | | | | | | | | | | | 540 | |
| gly | cys | val | pro | ala | ala | glu | his | arg | leu | arg | glu | glu | ile | leu |
| GGC | TGT | GTT | CCG | GCC | GCA | GAG | CAC | CGT | CTG | CGT | GAG | GAG | ATC | CTG |
| 550 | | | | | | | | | | | | | | |
| ala | lys | phe | leu | his | trp | leu | met | ser | val | tyr | val | val | glu | leu |
| GCC | AAG | TTC | CTG | CAC | TGG | CTG | ATG | AGT | GTG | TAC | GTC | GTC | GAG | CTG |
| 560 | | | | | | | | | | | | | 570 | |
| leu | arg | ser | phe | phe | tyr | val | thr | glu | thr | thr | phe | gln | lys | asn |
| CTC | AGG | TCT | TTC | TTT | TAT | GTC | ACG | GAG | ACC | ACG | TTT | CAA | AAG | AAC |
| 580 | | | | | | | | | | | | | | |
| arg | leu | phe | phe | tyr | arg | pro | ser | val | trp | ser | lys | leu | gln | ser |
| AGG | CTC | TTT | TTC | TAC | CGG | CCG | AGT | GTC | TGG | AGC | AAG | TTG | CAA | AGC |
| 590 | | | | | | | | | | | | | 600 | |
| ile | gly | ile | arg | gln | his | leu | lys | arg | val | gln | leu | arg | glu | leu |
| ATT | GGA | ATC | AGA | CAG | CAC | TTG | AAG | AGG | GTG | CAG | CTG | CGG | GAG | CTG |

FIGURE 53 (cont.)

| | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 610 | | | | | | | | | | | | | | |
| ser | glu | ala | glu | val | arg | gln | his | arg | glu | ala | arg | pro | ala | leu |
| TCG | GAA | GCA | GAG | GTC | AGG | CAG | CAT | CGG | GAA | GCC | AGG | CCC | GCC | CTG |
| 620 | | | | | | | | | | | | | | |
| leu | thr | ser | arg | leu | arg | phe | ile | pro | lys | pro | asp | gly | leu | arg |
| CTG | ACG | TCC | AGA | CTC | CGC | TTC | ATC | CCC | AAG | CCT | GAC | GGG | CTG | CGG |
| 630 | | | | | | | | | | | | | | |
| 640 | | | | | | | | | | | | | | |
| pro | ile | val | asn | met | asp | tyr | val | val | gly | ala | arg | thr | phe | arg |
| CCG | ATT | GTG | AAC | ATG | GAC | TAC | GTC | GTG | GGA | GCC | AGA | ACG | TTC | CGC |
| 650 | | | | | | | | | | | | | | |
| 660 | | | | | | | | | | | | | | |
| arg | glu | lys | arg | ala | glu | arg | leu | thr | ser | arg | val | lys | ala | leu |
| AGA | GAA | AAG | AGG | GCC | GAG | CGT | CTC | ACC | TCG | AGG | GTG | AAG | GCA | CTG |
| 670 | | | | | | | | | | | | | | |
| phe | ser | val | leu | asn | tyr | glu | arg | ala | arg | arg | pro | gly | leu | leu |
| TTC | AGC | GTG | CTC | AAC | TAC | GAG | CGG | GCG | CGG | CGC | CCC | GGC | CTC | CTG |
| 680 | | | | | | | | | | | | | | |
| 690 | | | | | | | | | | | | | | |
| gly | ala | ser | val | leu | gly | leu | asp | asp | ile | his | arg | ala | trp | arg |
| GGC | GCC | TCT | GTG | CTG | GGC | CTG | GAC | GAT | ATC | CAC | AGG | GCC | TGG | CGC |
| 700 | | | | | | | | | | | | | | |
| thr | phe | val | leu | arg | val | arg | ala | gln | asp | pro | pro | pro | glu | leu |
| ACC | TTC | GTG | CTG | CGT | GTG | CGG | GCC | CAG | GAC | CCG | CCG | CCT | GAG | CTG |
| 710 | | | | | | | | | | | | | | |
| 720 | | | | | | | | | | | | | | |
| tyr | phe | val | lys | val | asp | val | thr | gly | ala | tyr | asp | thr | ile | pro |
| TAC | TTT | GTC | AAG | GTG | GAT | GTG | ACG | GGC | GCG | TAC | GAC | ACC | ATC | CCC |
| 730 | | | | | | | | | | | | | | |
| gln | asp | arg | leu | thr | glu | val | ile | ala | ser | ile | ile | lys | pro | gln |
| CAG | GAC | AGG | CTC | ACG | GAG | GTC | ATC | GCC | AGC | ATC | ATC | AAA | CCC | CAG |
| 740 | | | | | | | | | | | | | | |
| 750 | | | | | | | | | | | | | | |
| asn | thr | tyr | cys | val | arg | arg | tyr | ala | val | val | gln | lys | ala | ala |
| AAC | ACG | TAC | TGC | GTG | CGT | CGG | TAT | GCC | GTG | GTC | CAG | AAG | GCC | GCC |
| 760 | | | | | | | | | | | | | | |
| his | gly | his | val | arg | lys | ala | phe | lys | ser | his | val | ser | thr | leu |
| CAT | GGG | CAC | GTC | CGC | AAG | GCC | TTC | AAG | AGC | CAC | GTC | TCT | ACC | TTG |

FIGURE 53 (cont.)

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| | | | 770 | | | | | | | | | | 780 | | |
| thr | asp | leu | gln | pro | tyr | met | arg | gln | phe | val | ala | his | leu | gln | |
| ACA | GAC | CTC | CAG | CCG | TAC | ATG | CGA | CAG | TTC | GTG | GCT | CAC | CTG | CAG | |
| | | | | | | | | 790 | | | | | | | |
| glu | thr | ser | pro | leu | arg | asp | ala | val | val | ile | glu | gln | ser | ser | |
| GAG | ACC | AGC | CCG | CTG | AGG | GAT | GCC | GTC | GTC | ATC | GAG | CAG | AGC | TCC | |
| | | | | | | | | | | | | | | | |
| | | | 800 | | | | | | | | | | 810 | | |
| ser | leu | asn | glu | ala | ser | ser | gly | leu | phe | asp | val | phe | leu | arg | |
| TCC | CTG | AAT | GAG | GCC | AGC | AGT | GGC | CTC | TTC | GAC | GTC | TTC | CTA | CCG | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | 820 | | | | | | | |
| phe | met | cys | his | his | ala | val | arg | ile | arg | gly | lys | ser | tyr | val | |
| TTC | ATG | TGC | CAC | CAC | GCC | GTG | CGC | ATC | AGG | GGC | AAG | TCC | TAC | GTC | |
| | | | | | | | | | | | | | | | |
| | | | 830 | | | | | | | | | | 840 | | |
| gln | cys | gln | gly | ile | pro | gln | gly | ser | ile | leu | ser | thr | leu | leu | |
| CAG | TGC | CAG | GGG | ATC | CCG | CAG | GGC | TCC | ATC | CTC | TCC | ACG | CTG | CTC | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | 850 | | | | | | | |
| cys | ser | leu | cys | tyr | gly | asp | met | glu | asn | lys | leu | phe | ala | gly | |
| TGC | AGC | CTG | TGC | TAC | GGC | GAC | ATG | GAG | AAC | AAG | CTG | TTT | GCG | GGG | |
| | | | | | | | | | | | | | | | |
| | | | 860 | | | | | | | | | | 870 | | |
| ile | arg | arg | asp | gly | leu | leu | leu | arg | leu | val | asp | asp | phe | leu | |
| ATT | CGG | CGG | GAC | GGG | CTG | CTC | CTG | CGT | TTG | GTG | GAT | GAT | TTC | TTG | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | 880 | | | | | | | |
| leu | val | thr | pro | his | leu | thr | his | ala | lys | thr | phe | leu | arg | thr | |
| TTG | GTG | ACA | CCT | CAC | CTC | ACC | CAC | GCG | AAA | ACC | TTC | CTC | AGG | ACC | |
| | | | | | | | | | | | | | | | |
| | | | 890 | | | | | | | | | | 900 | | |
| leu | val | arg | gly | val | pro | glu | tyr | gly | cys | val | val | asn | leu | arg | |
| CTG | GTC | CGA | GGT | GTC | CCT | GAG | TAT | GGC | TGC | GTG | GTG | AAC | TTG | CGG | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | 910 | | | | | | | |
| lys | thr | val | val | asn | phe | pro | val | glu | asp | glu | ala | leu | gly | gly | |
| AAG | ACA | GTG | GTG | AAC | TTC | CCT | GTA | GAA | GAC | GAG | GCC | CTG | GGT | GGC | |
| | | | | | | | | | | | | | | | |
| | | | 920 | | | | | | | | | | 930 | | |
| thr | ala | phe | val | gln | met | pro | ala | his | gly | leu | phe | pro | trp | cys | |
| ACG | GCT | TTT | GTT | CAG | ATG | CCG | GCC | CAC | GGC | CTA | TTC | CCC | TGG | TGC | |

FIGURE 53 (cont.)

940
gly leu leu leu asp thr arg thr leu glu val gln ser asp tyr
GGC CTG CTG CTG GAT ACC CGG ACC CTG GAG GTG CAG AGC GAC TAC

950
ser ser tyr ala arg thr ser ile arg ala ser val thr phe asn
TCC AGC TAT GCC CGG ACC TCC ATC AGA GCC AGT GTC ACC TTC AAC

960
arg gly phe lys ala gly arg asn met arg arg lys leu phe gly
CGC GGC TTC AAG GCT GGG AGG AAC ATG CGT CGC AAA CTC TTT GGG

970
val leu arg leu lys cys his ser leu phe leu asp leu gln val
GTC TTG CGG CTG AAG TGT CAC AGC CTG TTT CTG GAT TTG CAG GTG

980
asn ser leu gln thr val cys thr asn ile tyr lys ile leu leu
AAC AGC CTC CAG ACG GTG TGC ACC AAC ATC TAC AAG ATC CTC CTG

990
leu gln ala tyr arg phe his ala cys val leu gln leu pro phe
CTG CAG GCG TAC AGG TTT CAC GCA TGT GTG CTG CAG CTC CCA TTT

1000
his gln gln val trp lys asn pro thr phe phe leu arg val ile
CAT CAG CAA GTT TGG AAG AAC CCC ACA TTT TTC CTG CGC GTC ATC

1010
ser asp thr ala ser leu cys tyr ser ile leu lys ala lys asn
TCT GAC ACG GCC TCC CTC TGC TAC TCC ATC CTG AAA GCC AAG AAC

1020
ala gly met ser leu gly ala lys gly ala ala gly pro leu pro
GCA GGG ATG TCG CTG GGG GCC AAG GGC GCC GCC GGC CCT CTG CCC

1030
ser glu ala val gln trp leu cys his gln ala phe leu leu lys
TCC GAG GCC GTG CAG TGG CTG TGC CAC CAA GCA TTC CTG CTC AAG

1040
leu thr arg his arg val thr tyr val pro leu leu gly ser leu
CTG ACT CGA CAC CGT GTC ACC TAC GTG CCA CTC CTG GGG TCA CTC

1050
1060
1070
1080
1090

FIGURE 53 (cont.)

1100 1110
arg thr ala gln thr gln leu ser arg lys leu pro gly thr thr
AGG ACA GCC CAG ACG CAG CTG AGT CGG AAG CTC CCG GGG ACG ACG

1120
leu thr ala leu glu ala ala ala asn pro ala leu pro ser asp
CTG ACT GCC CTG GAG GCC GCA GCC AAC CCG GCA CTG CCC TCA GAC

1130 1132
phe lys thr ile leu asp OP
TTC AAG ACC ATC CTG GAC TGA TGGCCACCCGCCACAGCCAGGCCGAGAGCAGA
CACCAGCAGCCCTGTACGCGGGCTCTACGTCCCAGGGAGGGAGGGGCGGCCACACCC
AGGCCCGCACCGCTGGGAGTCTGAGGCCTGAGTGAGTGTGTTGGCCGAGGCCTGCATGTCC
GGCTGAAGGCTGAGTGTCCGGCTGAGGCCTGAGCGAGTGTCCAGCCAAGGGCTGAGTGTC
CAGCACACCTGCCGTCTTCACTTCCCCACAGGCTGGCGCTCGGCTCCACCCCAGGGCCAG
CTTTTCYTCACCAGGAGCCCGGCTTCCACTCCCCACATAGGAATAGTCCATCCCCAGATT
CGCCATTGTTACCCYTCGCCCTGCCYTCCTTTGCCTTCCACCCCCACCATCCAGGTGGA
GACCCTGAGAAGGACCCTGGGAGCTCTGGGAATTTGGAGTGACCAAAGGTGTGCCCTGTA
CACAGGCGAGGACCCTGCACCTGGATGGGGGTCCCTGTGGGTCAAATTGGGGGGAGGTGC
TGTGGGACTAAAATACTGAATATATGAGTTTTTCAGTTTTTGRAAAAAAAAAAAAAAAAAAA
AAAAAAAAAA

FIGURE 54

KPN1 17050
KPN1 18560
ECOR1 19475
SAC1 19652
SAC1 21083
ECOR1 23539
SAC1 24607
SAC1 29043

<-TCP